[illegible], N. I.

"Investigation of Technological Problems in Fabrication of Two-Layer Pipes." Thesis for Degree of Cand. Technical Sci. Sub 9 Feb 50, Moscow Order of Labor Red Banner Steel Inst imeni I. V. Stalin.

Summary 71, 4 Sep 52, Dissertations Presented for Degrees in Science and Engineering in Moscow in 1950. From Vechernyaya Moskva, Jan-Dec 1950.

SOV/133-58-8-13/30

AUTHORS: Teterin, P.K., Klyuchkin, N.L., Candidates of Technical Sciences, and Musorina, I.Ye., Korepanov, S.P., Sominskiy, Z.A., and El'bert, S.M., Engineers

TITLE: The Production of Two-layer Soldered Tubes (Proizvodstvo dvusloynykh payanykh trub)

PERIODICAL: Stal', 1958, Nr 8, pp 722 - 726 (USSR)

ABSTRACT: The process of production of two-layer soldered tubes was developed by TsNIIChM and tested on the Sinarskiy Pipe Plant. The tubes are made from a cold-rolled steel strip coated on both sides with a thin layer of copper. The edges of the strip are bevelled and the strip is formed into a two-layer tube semis with a close contact of the layers and overlapping of edges (Figure 1). The tube semis are passed through an electric furnace, heated to a temperature somewhat higher than the melting temperature of copper. The heating and cooling is done in a protective atmosphere. During the heating, soldering of the layers along the whole contact surface takes place. Thus, the manufacturing process consists of four main operations: copper coating of strip, bevel cutting of edges, forming of strip into tube semis and soldering. This kind of tube is being produced within a range of diameters from 6 to 16 mm with

Card1/4

the wall thicknesses from 0.6 to 0.9 mm. Low-carbon, mild steel (08) cold-rolled strip, 0.3 - 0.45 mm in thickness supplied in an annealed state in coils of a width corresponding to the required diameter of the tubes is used as a starting material. The strip is electrolytically coated with copper to a thickness of 4μ; 1 μ of copper is deposited from the cyanide electrolyte and 3 μ from an acid electrolyte. The coating process is continuous (Figure 2, table). The speed of strip through the electrolytic baths varies from 2.85 to 9.65 m/min, depending on its width. Cutting of edges is done in one pass without liquid cooling of knives. The rate of cutting up to 65 m/min (Figures 3 and 4). Forming of strip according to scheme shown in Figure 5 is done on a continuous 14-stand mill (Figure 6) produced by TsKBMM TsNIITMASh at a rate of 30-45 m/min. Formed semis are cut into a measured length (14 100 mm). Lots of 30 semis are passed for soldering in an electric resistance furnace (Figure 7) consisting of two chambers: heating and cooling. The temperature of the heating chamber is maintained at 1130 - 1140 °C. The rate of

The Production of Two-layer Soldered Tubes

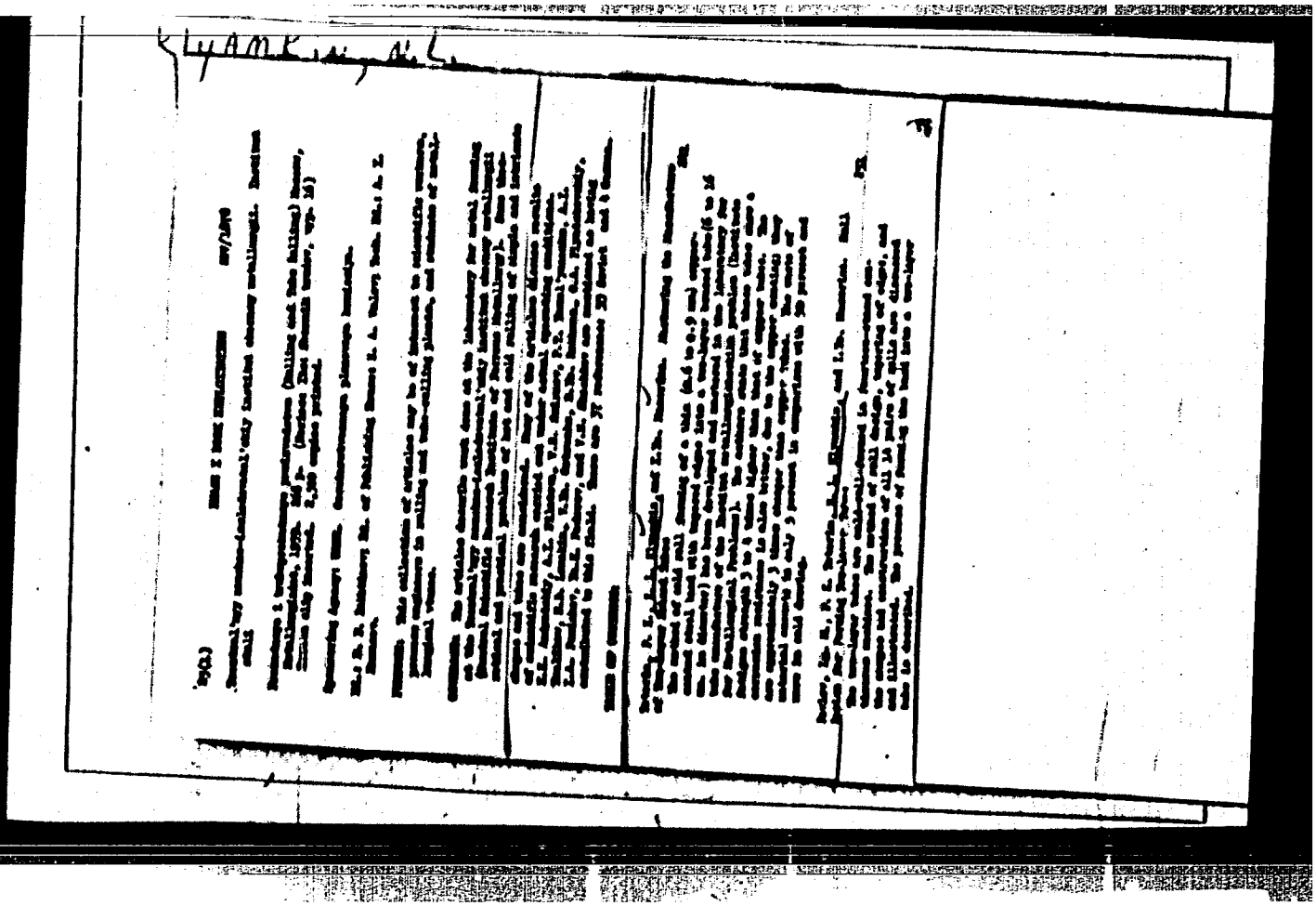
passage through the furnace varies from 0.78 to 2.0 m/min, depending on the tube diameter. Protective atmosphere is obtained from charcoal gas producer (CO 31-37%, H_2 > 11%, CH_4 0.2-0.7%, CO_2 1-4%, humidity 7-10 g/m^3). In order to retain a uniform distribution of copper on the surface of tubes during soldering, the latter are coated with a thin layer of a special coating material (not specified) before soldering. It is stated that the mechanical properties of tubes are similar to those of seamless tubes from mild steel (tensile strength 38-42 kg/mm^2, relative elongation 24-30% and pass the hydraulic test according to GOST 301-50). It is pointed out that the process of production of the above tubes is already introduced into practice. It presents significant, technical and economic advantages in comparison with the drawing process. Such tubes can replace

The Production of Two-layer Soldered Tubes SOV/133-58-8-13/30

successfully steel seamless tubes as well as copper and brass tubes, thus providing a large saving of non-ferrous metals.
There are 7 figures and 1 table.

ASSOCIATION: TsNIICHM and Sinarskiy trubnyy zavod (Sinarskiy Pipe Plant)

Card 4/4 1. Pipes--Production 2. Steel--Coatings 3. Furnaces--Applications



SOV/133-59-9-17/31

AUTHORS: Klyamkin, N.L., Candidate of Technical Sciences, Manegin, Yu.V., Ronyushenko, A.T., Golovkin, R.V. and Protopopov, N.N., engineers

TITLE: Mastering of the Production of Tubes by Atomic Hydrogen Welding

PERIODICAL: Stal', 1959, Nr 9, pp 821-827 (USSR)

ABSTRACT: In view of some difficulties in piercing tube billets from some alloy steels and a high consumption of metal in subsequent rolling, the production of tubes from such steels by atomic hydrogen welding of strip should be more economical. After investigations of the process by TsNIIChM and the Moscow Tube Works on an industrial plant for the automatic atomic hydrogen welding of tubes was developed. Conditions of stability of welding arc on the diameter of electrodes and their holders supplying hydrogen - table 1; the dependence of electric parameters of the arc on the rate of the supply of hydrogen and the distance between the centres of electrodes - Fig 3 and 4 respectively. The installation for the production of alloy tube consists of a modified tube forming stand of the type 10 - 60, six arcs automatic welding head with a control panel, welding transformers and a system of power,

Card 1/2

Mastering of the Production of Tubes by Atomic Hydrogen Welding

gas and water conduits (Fig 5). The welding head - Fig 6; scheme for automatic control - Fig 7. Welding conditions for steels 1Kh18N9, Kh18N11B, EI533 and 50KhFA - Table 2; results of testing of welded tubes - Table 3; macro and microstructure of welded seam - Fig 8 and 9 respectively. The results of testing of welded tubes indicated that their properties correspond to standards for seamless stainless tubes (GOST 5543-50). There are 9 figures and 3 tables.

ASSOCIATIONS: TsNIIChM
Moskovskiy trubnyy zavod (Moscow Tube Works)

L 8940-65 EWT(m)/EWP(k)/T/EWP(q)/EWP(b) PT-4 MJW/JD/HW

ACCESSION NR: AP4043486 S/0133/64/000/008/0721/0724

AUTHOR: Teterin, P. K.; Klyamkin, N. L.; Trifonov, Ye. A.; Abramov, A. A.

TITLE: Rolling of seamless pipes from ingots of heat-resistant alloys

SOURCE: Stal', no. 8, 1964, 721-724

TOPIC TAGS: seamless pipe, refractory alloy seamless pipe, refractory alloy pipe rolling, seamless pipe rolling, refractory alloy ingot piercing

ABSTRACT: A technique has been developed for piercing solid billets on a helical rolling stand followed by hot and cold rolling of high-quality seamless pipes from heat-resistant nickel-base alloys, EI435 (U.S. Nimonic 75) and EI559A (0.02% C, 56.5% Ni, 15.9% Cr, 3.42% Al, 0.5% Si). Preliminary laboratory tests showed EI435 alloy to be more resistant to deformation and more ductile than EI559A alloy. After heating to 1240C in 50 min, EI435 alloy had a grain size rating of 4—5 and satisfactory tensile strength, ductility, and heat resistance at high temperatures. In industrial test piercing of EI435 alloy billets

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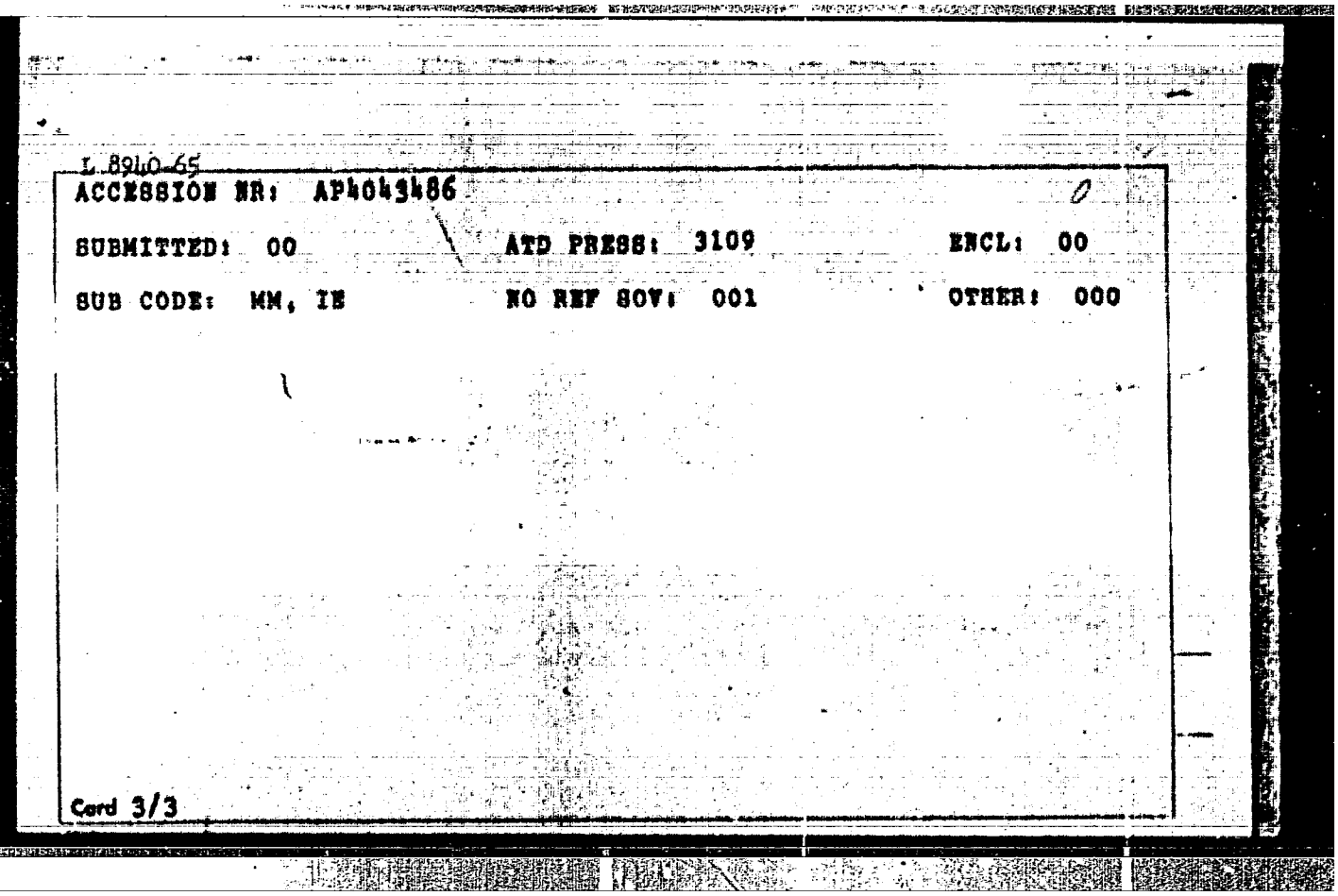
L 8940-65

ACCESSION NR: AP4043486

(57 mm in diam, 400 mm long) and EI559A alloy billets (50 mm in diam, 300 mm long), the best results were obtained by heating the billets to 1240C, using a mandrel, 32 mm in diam, made of a refractory Mo-base alloy [composition unspecified], glass lubricants No. 185V or 209 [composition unspecified], rolls at a 7-deg incline to the horizontal center line, and a roll peripheral speed of 1.5 m/sec. The pipe shells produced had a diameter of 52 and 47 mm, respectively, a wall thickness of 10 and 7.5 mm, and good smooth surfaces. The steels were rolled with a mandrel of 3Kh2V8 steel [AISI420] at 1240C in two passes with intermediate heating to 1200—1220C. Prior to cold rolling, the pipes were heated at 1150C for 15 min and air cooled. Pipes 32 x 3 mm, 10 x 1.0 mm, and other sizes were produced by the above technique. EI435 and EI559A alloy pipes (22 x 3 mm) had a tensile strength of 73.0 and 57.2 kg/mm^2, and an elongation of 32.2 and 53.4%, respectively. All pipes withstood cold bending 3 times the diameter. EI559A alloy pipes withstood full flattening, EI435 alloy pipes, flattening to a gap of 2 times wall thickness; the latter also withstood flaring to the outside diameter of 24.0 mm or 9.1%. Orig. art. has: 6 figures and 4 tables.

ASSOCIATION: TsNIICHM

Card 2/3



L 8940-65

ACCESSION NR: AP4043486 0

SUBMITTED: 00 ATD PRESS: 3109 ENCL: 00

SUB CODE: MM, IE NO REF SOV: 001 OTHER: 000

Card 3/3

TETERIN, P.K.; KLYAMKIN, N.L.; TRIFONOV, Ye.A.; ABRAMOV, A.A.

Mastering the rolling of seamless pipe made of heat-resistant alloys. Stal' 24 no.8:721-724 Ag '64. (MIRA 17:9)

1. TSentral'nyy nauchno-issledovatel'skiy institut chernoy metallurgii imeni I.P. Bardina.

L 59274-65 EWP(k)/EWP(s)/EWA(c)/EWT(m)/EWT(d)/EWP(h)/EWP(b)/T/EWA(d)/EWP(l)/
EWP(w)/EWP(v)/EWP(t) Pf-4 MJW/JD/BW
ACCESSION NR: AT5016068 UR/2776/65/000/039/0206/0213

AUTHOR: Klyamkin, N. L.; Trifonov, Ye. A.

TITLE: Using special steels and alloys for tube rolling

SOURCE: Moscow. Tsentral'nyy nauchno-issledovatel'skiy institut chernoy metallurgii. Sbornik trudov, no. 39, 1965. Spetsial'nyye stali i splavy (Special steels and alloys), 206-213

TOPIC TAGS: alloy steels, stainless steels, hot working, cold deformation, metal mechanical property, thermomechanical treatment

ABSTRACT: A series of special steels (KhN78T, KhN60Yu, 1Kh25N25TR, Kh25N16G7AR, Kh13N14SChB, and 1Kh13SMFB) were processed by hot and cold tube rolling. Both two and three roll piercing mills were used to make seamless tubes of 30-60 mm external diameter, at speeds of 1.25-5 m/sec, with feed angles varying from 0 to 10°. Ductility was determined by torsion testing of the materials at tube rolling temperatures (1050-1250°C). The number of twists to failure is plotted along with torque as a function of temperature. Data are given for hot tube piercing. Included are the mill parameters, as well as material dimensions and temperatures. Schematic

Card 1/2

L 59274-65
ACCESSION NR: AT5016068

diagrams of calibrations made for the three roll mill are shown, since proper calibration is critical in eliminating surface cracks and torn ends. Similar results are reported for cold tube rolling on a different stand (KhPT-32). The particular behavior for each one of the steels, in both hot and cold forming, was discussed, and the mechanical and technical properties of the processed tubes were tabulated. Strength and ductility varied widely among the steels, and was quite different, depending on whether hot or cold forming was done. Usually, cold forming resulted in cracked ends due to the very low ductility. Orig. art. has: 3 figures, 4 tables.

ASSOCIATION: none

SUBMITTED: 00 ENCL: 00 SUB CODE: MM, IE

NO REF SOV: 003 OTHER: 000

Card 2/2

OSADCHIY, V.Ya.; GETIYA, I.G.; MOGILEVKIN, F.D.; ALISHEVSKIY, L.Ye.; KLYAMKIN, N.L.; KATS, G.I.

Deformation and rate conditions of the pipe reduction process on a three-high mill. Izv. vys. ucheb. zav.; chern. met. 8 no.11:83-87 '65. (MIRA 18:11)

1. Moskovskiy institut stali i splavov.

KLYAKIN, S.L.

ROMANENKO, N.V., inzhener; KLYAKIN, S.L., inzhener.

Operation of a feed-water pump of type 5TS-10 on water with a temperature of 158° C. Energetik 5 no.5:16 My '57. (MLRA 10:6)
(Boilers)

KLYAMKIN, Solomon L'vovich; TUHYANSKIY, L.I., inzh., red.; SOBOLEV, Ye.M., tekhn. red.

[Thermal testing of steam-turbine systems in electric power plants] Teplovoe ispytanie paroturbinnykh ustanovok elektrostantsii. Moskva, Gos. energ.izd-vo, 1961. 407 p. (MIRA 15:3)

(Steam turbines--Testing)

KLYAMKO, E. I.

UNESCO/NS/ICIP/ABSTRACT/E.2.5.

METHODS OF SPEEDING-UP THE OPERATION OF DIGITAL COMPUTERS

I. Y. AKUSHSKY, L. B. YEMELYANOV-YAROSLAVSKIY, E. A. KLIYAMKO,
V. S. LINSKY, G. D. MONAKHOV
Institute for Scientific Research of Electonic
Mathematical Machines, Moscow, USSR.

In the paper are considered different methods of speeding-up operations in digital computers.

Methods of accelerating the digit by digit multiplication by overlapping in time the operations of addition and shift; the method of the "travelling wave" when the addition of several partial products is effected simultaneously, etc.

For speeding-up the division operation a method is recommended by which the information contained in the code of the next remainder is used for determining in one step the group of the quotient consecutive digits.

Are considered the advantages, from the point of view of operation speeding-up, of storage of codes in not normalised condition and representation of negative numbers in the machine in reverse code (with introduction of code feature). Combined methods of calculation of certain algebraic expressions in the conditions of an arithmetic device with an increased number of components.

Methods are described for speeding-up the addition elementary operation, which ensure single-shot operation of each component of the add circuit, as well as the methods of speeding up the group shift by means of a special shifter desigmed in the form of a ferrite matrix.

Considerations are given on the expediency of including the calculations of the values of elementary functions in the list of main machine operations, and some algorithms are given (which are adaptable for their circuit execution by the arithmetic device), on

Paper presented at Intl. Conf. on Information Processing, UNESCO House, Paris, 15-20 Jul 59

the basis of which these values are formed of the operations of addition and group shift. The role of microprogram control for accelerating operations is discussed. In particular, at microprogram control, when a single-sided high-speed large caracity memory is used, it seems possible to obtain efficient results by calculating the elementary function values on the basis of block-poly-nomial approximation of functions by different polynomials at various intervals.

PAPER PRESENTED AT
INTERNATIONAL CONF. ON INFORMATION PROCESSING
UNESCO HOUSE, PARIS
15 - 20 JUNE 1959

KLYAMKO, E.I.; MOMAKHOV, G.D.

Method for speeding up binary division done on digital computing machines. Priborostroenie no.2:9-11 F '57. (MIRA 10:4)
(Calculating machines)

KLYAMKO, N.I.

Some applications of Chaplygin's method to the approximate solution of differential equations with a retarding argument. Usp.mat.nauk 12 no.4:305-312 Jl-Ag '57. (MIRA 10:10)
(Approximate computation) (Differential equations)

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16,6800

S/024/60/000/03/009/028
E140/E463

AUTHOR: Klyamko, E.I. (Moscow)

TITLE: Increasing Computer Reliability by Doubling the Equipment and Restoration of the Reserve

PERIODICAL: Izvestiya Akademii nauk SSSR, Otdeleniye tekhnicheskikh nauk, Energetika i avtomatika, 1960, Nr 3, pp 73-77 (USSR)

ABSTRACT: The reliability of a computer may be characterized by the quantities p(t) the probability of the machine remaining in correct operation during a time t; s(t) the probability of detecting an error in the machine during a time t after its occurrence; τ(t) the probability of repairing the machine during a time t after detecting error. A system is considered in which there are two machines, one of which is in reserve. When an error is detected in the operating machine it is automatically disconnected and the reserve machine connected to the input-output equipment. The reliability of such a system is analysed for two special cases: the machines are regularly subjected to preventive maintenance and, therefore, the unreliability at a given time is dependent only on the

Card 1/2

KLYAMKO, E. I. Cand Tech Sci -- "Certain problems of the theory of reliability of computers with ~~emergency~~ reserve equipment." Mos, 1961 (Min of Higher and Secondary Specialized Education RSFSR. Mos Order of Lenin and Order of Labor Red Banner Higher Tech School im N. E. Bauman). (KL, 4-61, 196)

13,2927

23162
S/024/61/000/003/010/012
E140/E463

AUTHOR: Klyamko, E.I. (Moscow)

TITLE: Systems reliability with replacement

PERIODICAL: Izvestiya Akademii nauk SSSR, Otdeleniye tekhnicheskikh nauk, Energetika i avtomatika, 1961, No.3, pp.117-120

TEXT: In the author's previous work (Ref.1: Izd. "Sovetskoye radio", 1960; Ref.2: Izv. AN SSSR, OTN, Energetika i avtomatika, 1960, No.3) the probability of correct operation of a redundant system was studied where the replacement of defective parts is carried out in a very short time. As the replacement (or repair) time decreases without limit, the reliability of such a system approaches as closely as desired to unity. The problem was solved in the previous work on the basis of particular assumptions. The present note concerns a system which may be described as follows: 1) the system consists of two identical independent subsystems; the system can operate in the absence of simultaneous fault in both subsystems; 2) two cases may be distinguished - a) the probability of fault is independent of the previous history of the unit, b) after repair the subsystem reliability returns to an initially higher value; 3) the repairability of an element is

Card 1/2

Systems reliability ... S/024/61/000/003/010/012
E140/E463

independent of the time at which a fault arises, but is dependent only on the duration of repair work. The solution leads to integral equations of the Volterra type. There are 2 Soviet references.

SUBMITTED: April 1, 1960

Card 2/2

KLYAMKO, E.I.; KITOV, A.I., red.; KUKOLEVA, T.V., red.; GUTCHINA, N.Ya., red.; BELYAYEVA, V.V., tekhn. red.

[Network and test control in automatic digital computers] Skhemnyi i testovyi kontrol' avtomaticheskikh tsifrovykh vychislitel'nykh mashin. Moskva, "Sovetskoe radio," 1963. 191 p. (MIRA 16:12)

(Electronic digital computers)

L 4945-66

ACC NR: AP5025745 SOURCE CODE: UR/0286/65/000/018/0093/0093

AUTHOR: Klyenko, E. I.

ORG: none

TITLE: A method for accomplishing transitions to subprograms at an arbitrary point of the basic program in digital computers. Class 42, No. 174848

SOURCE: Byulleten' izobreteniy i tovarnykh znakov, no. 18, 1965, 93

TOPIC TAGS: digital computer, computer technique, computer system, computer switching, computer programming, computer control

ABSTRACT: This Author Certificate presents a method for accomplishing transitions to subprograms at an arbitrary point of the basic program in digital computers. It is designed to increase the control effectiveness of the machine with simultaneous economy of equipment. A signal is shaped with the help of an apparatus which accomplishes the stop based on the address in the control panel (command address, number address, index-list). This signal, via operation mode switches ("stop", "shift", "terminate"), is fed to circuits controlling the shifting

Card 1/2

UDC: 681.142-523.8-501.7

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L 4945-66

ACC NR: AP5025745

according to the address set on the [illegible] of the machine control panel or by means of a system of programmed breaks. The switches for the operation mode and the type of transition are controlled with the help of hand controlling units on the machine control panel.

SUB CODE: DP, EC/ SUBM DATE: 21Sep64

Card 2/2

DENISOV, K.N., kand. tekhn. nauk; KLYAKHER, A.F.,

Comparative evaluation of and outlook for the development of foreign navigational digital computers. Inform. sbor. TSNITMF no. 120. Sudovoth. i aviats. no. 27:24-31 '64 (MIRA 19:1)

KLYANINA, G.L.; SHLYGIN, A.I.

Possibility of the electrooxidation of sulfur dioxide by electrolytic oxygen. Soob. DVFAN SSSR no. 15:27-30 '62. (MIRA 17:9)

1. Dal'nevostochnyy gosudarstvennyy universitet i Dal'nevostochnyy filial imeni Komarova Sibirskogo otdeleniya AN SSSR.

KLYANINA, G.L.; SHLYGIN, A.I.

Mechanism of the electroreduction of sulfur dioxide on platinum. Zhur. fiz. khim. 36 no.9:1849-1853 S '62. (MIRA 17:6)

1. Dal'nevostochnyy gosudarstvennyy universitet, Vladivostok.

KLYANINA, G.L.; SHLYGIN, A.I.

Electronic interaction of sulfur dioxide and an electrode and new possibilities for the experimental determination of oxidation-reduction potentials. Soob.DVFAN SSSR no.12:37-41 '60. (MIRA 13:11)

1. Dal'nevostochnyy gosudarstvennyy universitet i Dal'nevostochnyy filial imeni V.L.Komarova Sibirskogo otdeleniya AN SSSR.
(Oxidation-reduction reaction) (Sulfur dioxide)

KLYANINA, G.L.; SHLYGIN, A.I. (Vladivostok)

Mechanism of the electrolytic reduction of sulfur dioxide on poisoned electrodes. Zhur.fiz.khim. 35 no.11:2598-2601 N '61. (MIRA 14:12)

1. Dal'nevostochnyy gosudarstvennyy universitet, kafedra fizicheskoy khimii.

(Sulfur dioxide)
(Reduction, Electrolytic)

KLYANINA, O.I.; SHLYGIN, A.I.

Mechanism of the electrolytic oxidation of sodium sulfite.
Zhur. fiz. khim. 36 no.6:1310-1312 Je'62 (MIRA 17:7)

1. Dal'nevostochnyy universitet, Vladivostok.

BERESTOV, A.V. (Head District Veterinary Doctor), BERESTOV, V.A. (Candidate of Veterinary Sciences), KLYAPISHEV, L.A., SHAKHANOVA, V.I. and MAKAROV, N.V. (Veterinary Doctors), BARABOSHIN, S.A., BUCHINOV, I.N., LYAMIN, A.F., FEDOROV, Yu. I., and FILIMONOV, I. Ya. (Veterinary Medical Assistants, Ul'yanov Oblast', Terentul'sk District).

"Protein hydrolysates in dispepsia in new born calves..."
Veterinariya, vol. 39, no. 3, March 1962 pp. 71

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PROCESSES AND PROPERTIES INDEX

Influence of argon admixture on the neon discharge. Ye. S. Vsegodskii and B. N. Klyarfeld. J. Tech. Phys. (U. S. S. R.) 3, 610-13(1933).—Curves show that 2.5% A lowers light emission 35-70%, depending on the current used.

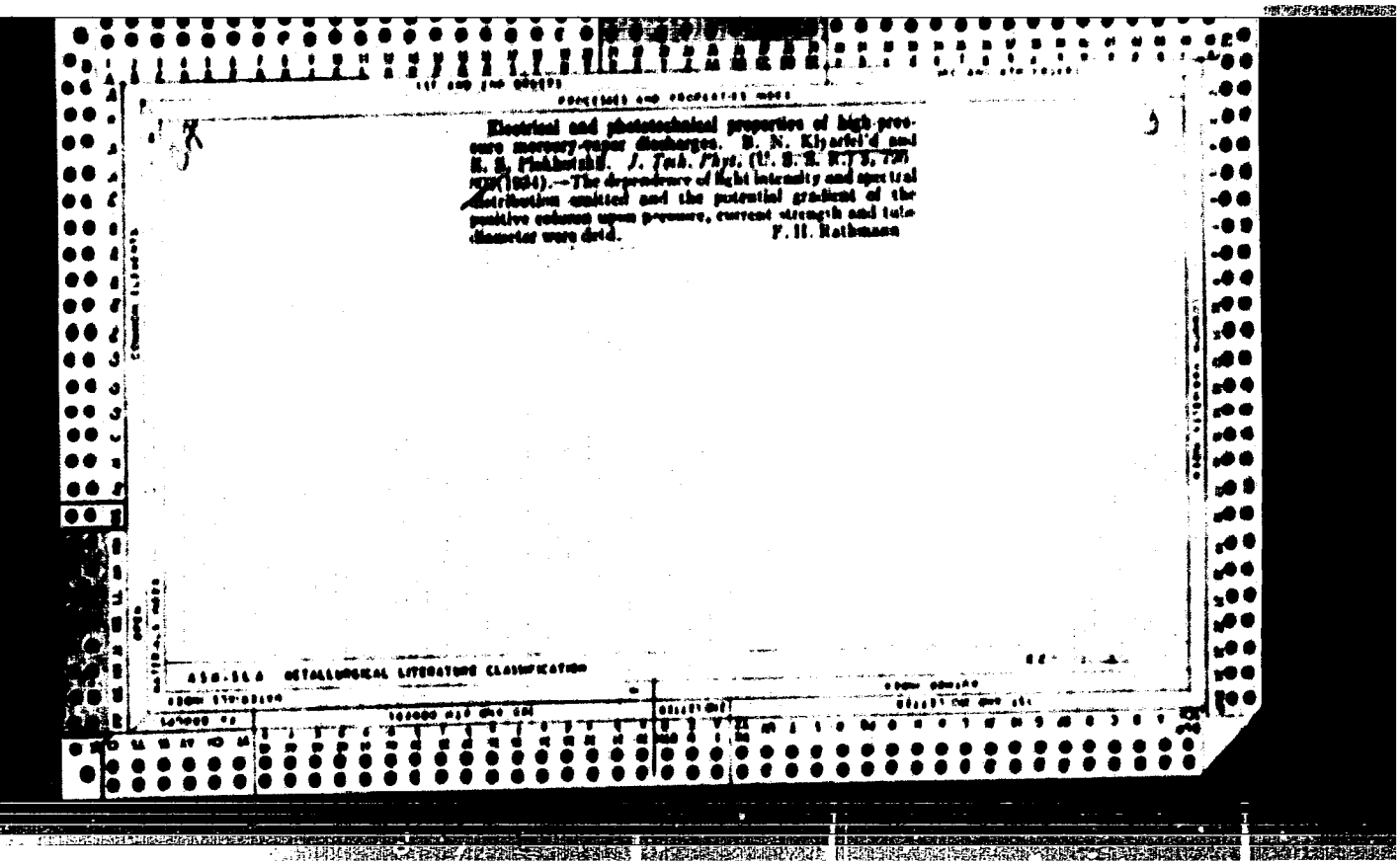
F. H. Rathmann

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

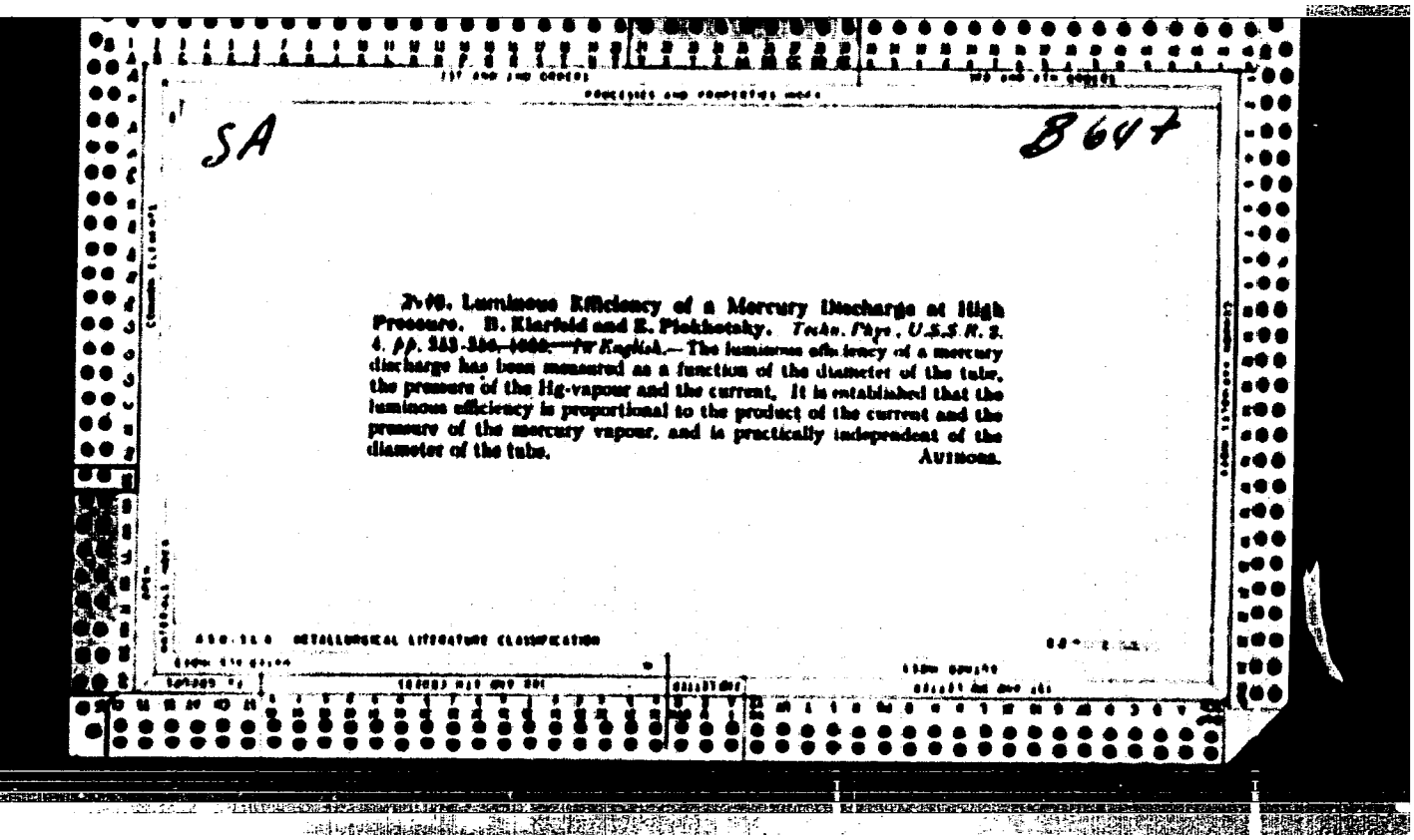
Lighting efficiency and the potential gradient in the positive column of discharge in neon. B. N. Kh[illegible] and I. M. T[illegible]. *J. Tech. Phys.* (U. S. S. R.) 4, 804-11(1934); *Tech. Phys. U. S. S. R.* 1, 21-30(1934) (in English).—Under similar conditions the light efficiency increases with increase in diam. of tube, the position of max. economy moving toward lower pressures, but depends little upon pressure. With a tube of a diam. of 61 mm. and current of 3 amp. an efficiency of 12 lumens per watt was obtained. In tubes with diam. of 13-30 mm. a max. of 20-26 lumens per watt is possible. Depending upon c. d., the lighting efficiency at first rapidly increases and then slowly decreases. At max. efficiency the av. brightness of illumination for tubes of different diams. varies within the narrow limits of 1.5-2. The potential gradient in the discharge column decreases with increase of c. d. Depending upon pressure the potential gradient at first rapidly decreases and then slowly begins to increase.

[illegible]

METALLURGICAL LITERATURE CLASSIFICATION



Electrical and photoelectrical properties of high-pressure mercury-vapor discharges. D. N. Klyarfel'd and E. E. Finkel'shtein. *J. Tech. Phys.* (U. S. S. R.) 5, 721 (1935).—The dependence of light intensity and spectral distribution emitted and the potential gradient of the positive column upon pressure, current strength and tube diameter were detd. F. H. Rathmann



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8647

3v48. Luminous Efficiency of a Mercury Discharge at High Pressure. B. Kiarfeld and E. Plokhotsky. *Techn. Phys. U.S.S.R.* 2. 4. pp. 383-386. 1935.—*In English.*— The luminous efficiency of a mercury discharge has been measured as a function of the diameter of the tube, the pressure of the Hg-vapour and the current. It is established that the luminous efficiency is proportional to the product of the current and the pressure of the mercury vapour, and is practically independent of the diameter of the tube.

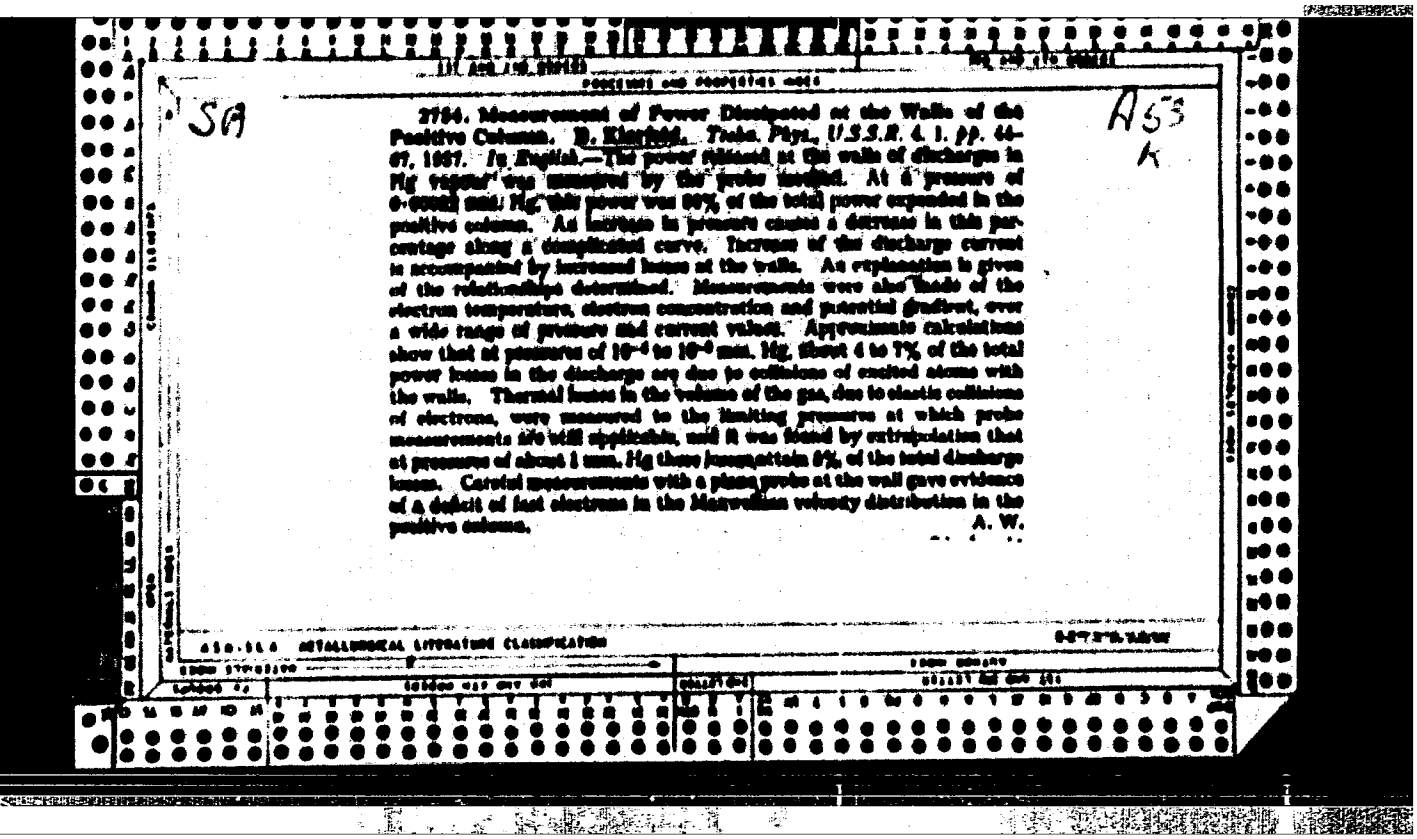
AUTHORS.

1A 3

Luminous efficiency of the positive column of a discharge in sodium vapor. B. N. Klyarfel'd and I. M. Tarashov. *Tech. Phys. U. S. S. R.* 3, [illegible] (1936) (in English); cf. *C. A.* 30, [illegible].—The portion of the total energy in the pos. column which is transformed into the energy of the yellow lines of Na has been measured in the presence of various quantities of the rare gases A, Ne and He and at various Na vapor pressures. At the same time the potential gradient and mean brightness were detd.

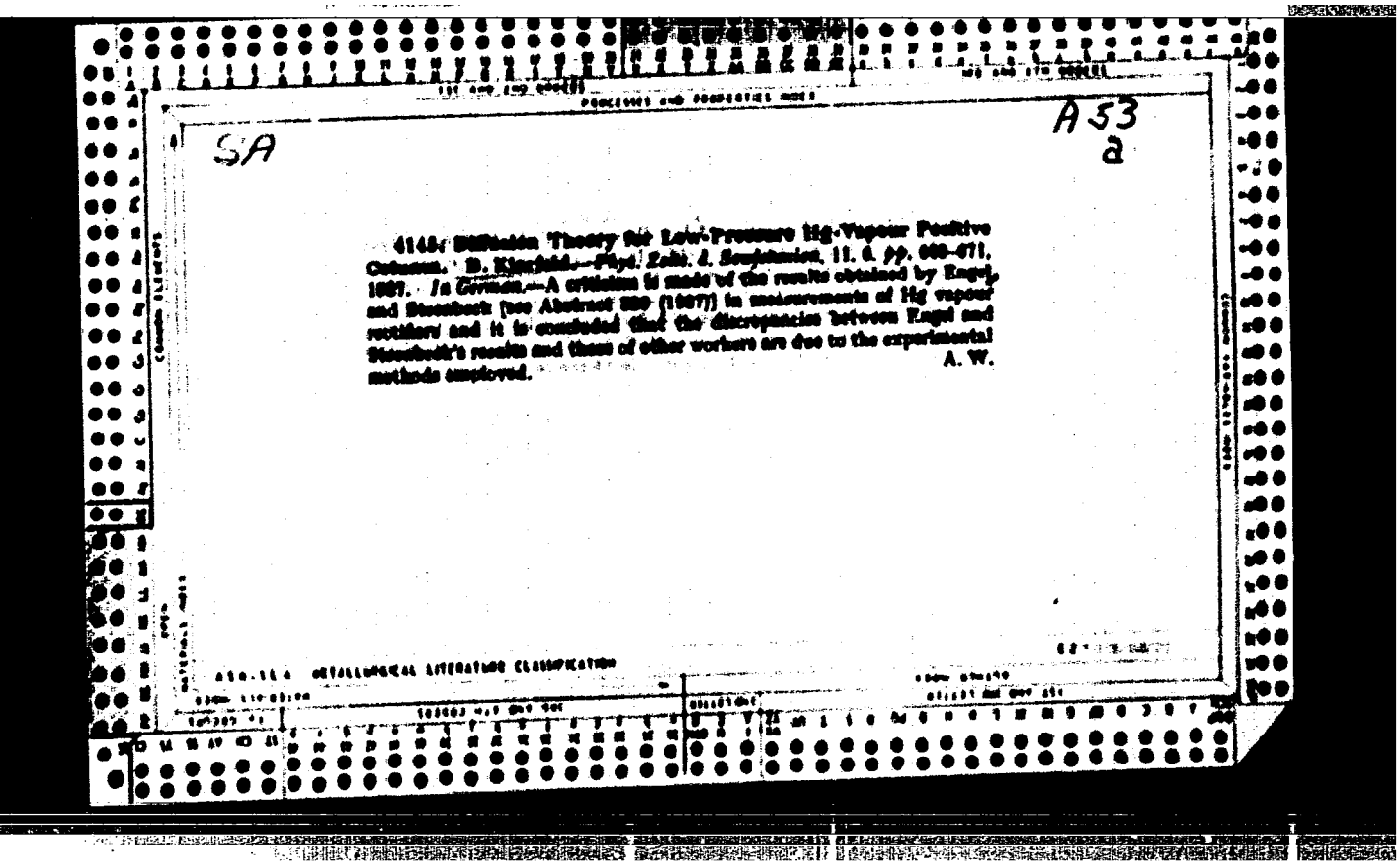
Harold Gershinowitz

ASO-SLA METALLURGICAL LITERATURE CLASSIFICATION



2764. Measurement of Power Dissipated at the Walls of the Positive Column. B. Klarfeld. *Techn. Phys., U.S.S.R.* 4, 1, pp. 44–57, 1937. *In English.*—The power released at the walls of discharges in Hg vapour was measured by the probe method. At a pressure of 0·00031 mm. Hg this power was 99% of the total power expended in the positive column. An increase in pressure causes a decrease in this percentage along a complicated curve. Increase of the discharge current is accompanied by increased losses at the walls. An explanation is given of the relationships determined. Measurements were also made of the electron temperature, electron concentration and potential gradient, over a wide range of pressure and current values. Approximate calculations show that at pressures of 10^{-4} to 10^{-3} mm. Hg, about 4 to 7% of the total power losses in the discharge are due to collisions of excited atoms with the walls. Thermal losses in the volume of the gas, due to elastic collisions of electrons, were measured to the limiting pressures at which probe measurements are still applicable, and it was found by extrapolation that at pressures of about 1 mm. Hg these losses attain 5% of the total discharge losses. Carried measurements with a plane probe at the wall gave evidence of a deficit of fast electrons in the Maxwellian velocity distribution in the positive column.

A. W.



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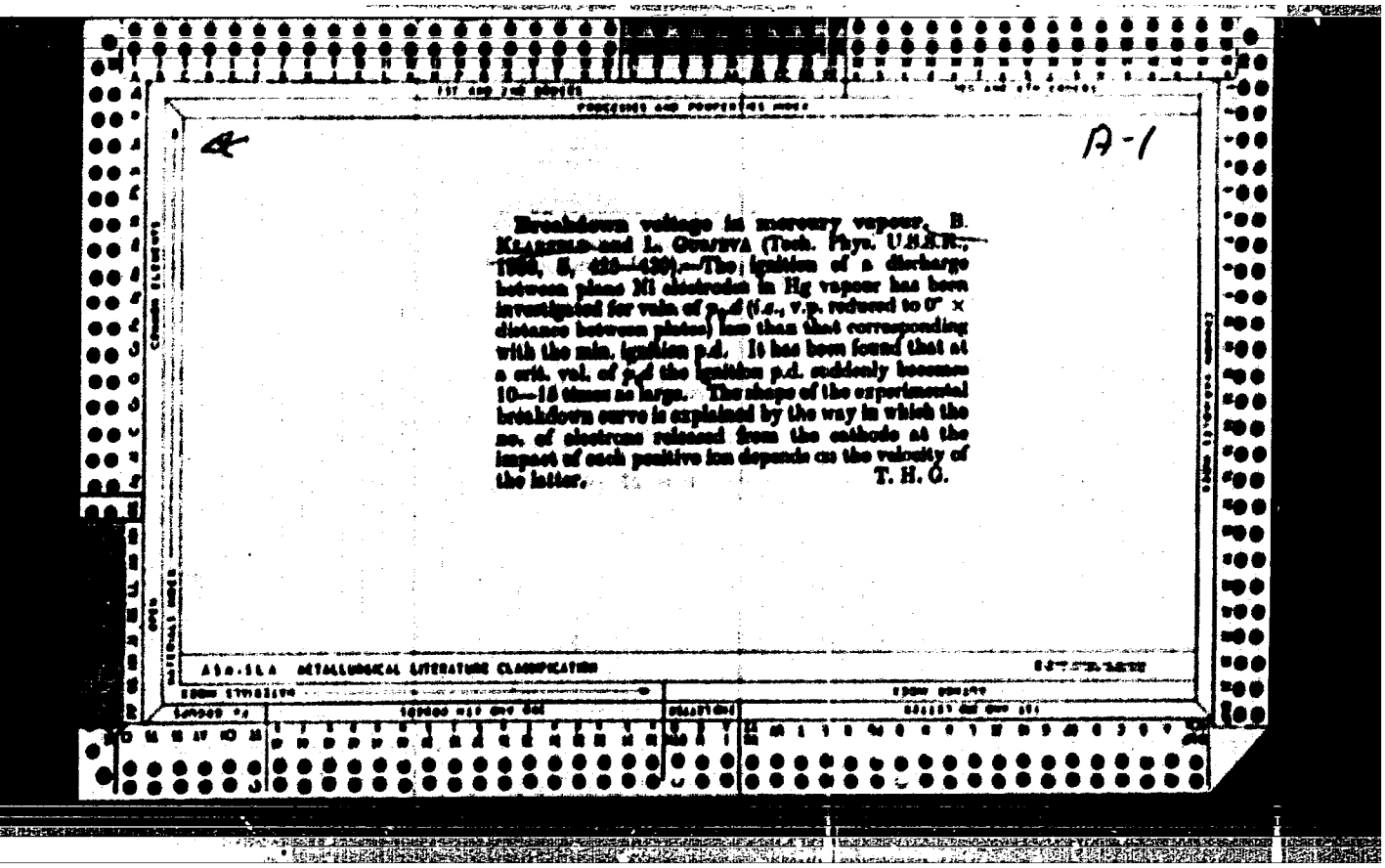
4145. Diffusion Theory for Low-Pressure Hg-Vapour Positive Columns. B. Kjerfald.—*Phys. Zeits. d. Sowjetunion*, 11, 6, pp. 660–671, 1937. *In German.*—A criticism is made of the results obtained by Engel and Steenbeck (see Abstract 889 (1937)) in measurements of Hg vapour rectifiers and it is concluded that the discrepancies between Engel and Steenbeck's results and those of other workers are due to the experimental methods employed. A. W.

PROCESSES AND PROPERTIES INDEX

The limits of applicability of the theory of low pressure plasma. B. N. Klyarfel'd. *Bull. acad. sci. U. R. S. S.*, [illegible] 1938, No. 4, [illegible] (in English, [illegible]). The purpose of this investigation was to det. the applicability limits of the low pressure column theory, and to investigate the nature of ionization in the column at various pressures, and at various discharge currents. Special attention was given to the thermal regime in the tube that provided pressure variation independent of the current variation. This was accomplished by submerging the whole tube (diam. [illegible] mm.) in a water bath. A correction was made for the temp. drop between the inner and the outer surface of the glass wall. Measurements were made at [illegible], [illegible], [illegible] and [illegible] mm. Hg. At each pressure the discharge current was varied from 0.1 to 10 amp. The results are in satisfactory agreement with the data of the previous investigation. As a result of the expts. it can be concluded that the quant. conclusions of the theory of Tonks and Langmuir (C. A. 24, [illegible]) hold only for the investigated tube up to pressures of several thousandths of a mm. At pressures above [illegible] mm. a marked discrepancy begins between the exptl. and the theoretical data. The ionization capacity of the electrons at p = [illegible] mm. does not depend on the current. At higher pressures it increases with the current; this points to the development of the cumulative processes. Within the region of application of the Schottky's diffusion theory (C. A. 19, [illegible]) ionization cannot be considered as a direct one-stage process. Six references. W. R. Henn

METALLURGICAL LITERATURE CLASSIFICATION



A-1

Breakdown voltage in mercury vapour. B. KLARFELD and L. GOUSEVA (Tech. Phys. U.S.S.R., 1938, 5, 422—430).—The ignition of a discharge between plane Ni electrodes in Hg vapour has been investigated for vals. of p_0d (i.e., v.p. reduced to 0° × distance between plates) less than that corresponding with the min. ignition p.d. It has been found that at a crit. val. of p_0d the ignition p.d. suddenly becomes 10—15 times as large. The shape of the experimental breakdown curve is explained by the way in which the no. of electrons released from the cathode at the impact of each positive ion depends on the velocity of the latter. T. H. G.

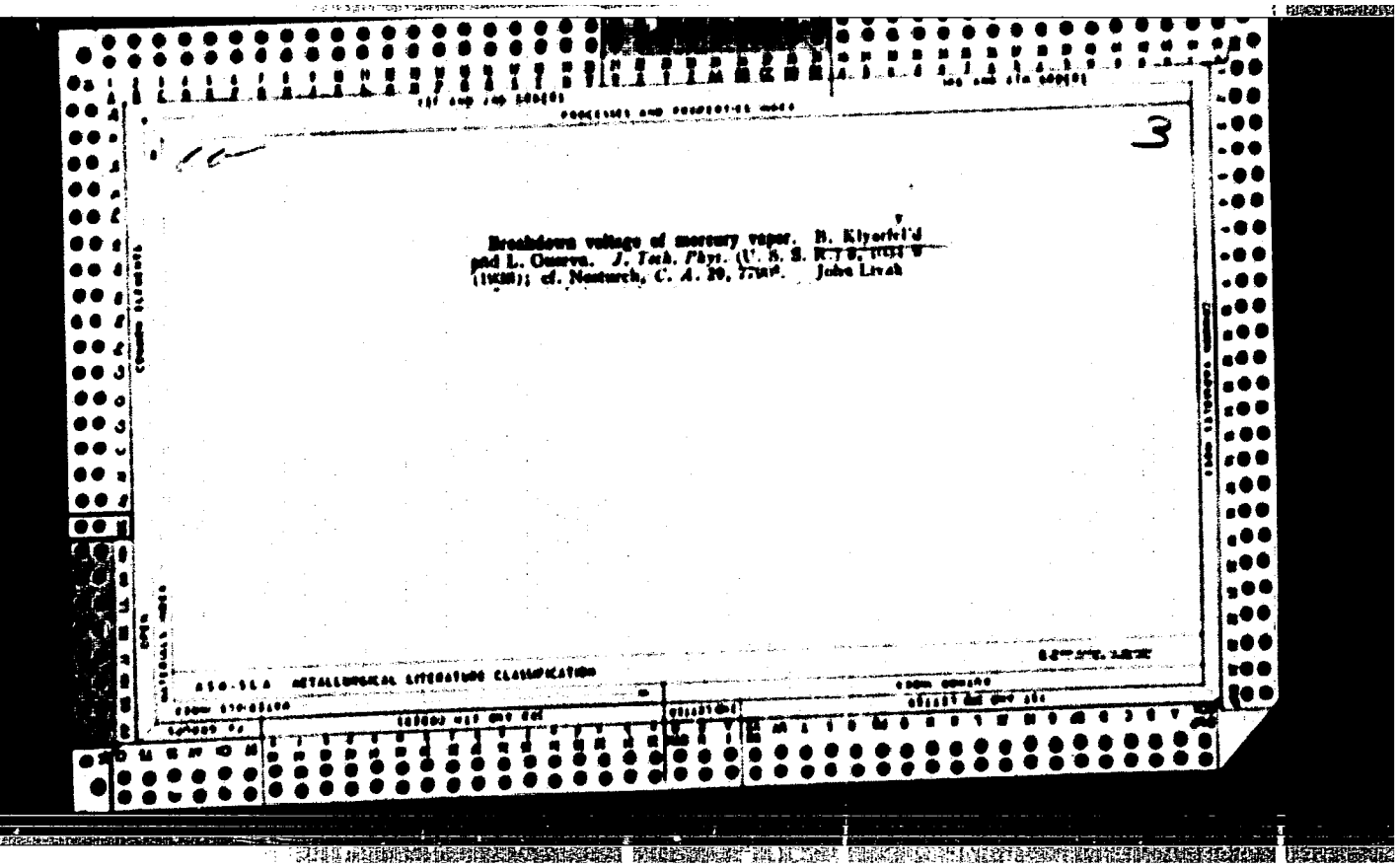
PROCESSES AND PROPERTIES INDEX

A-1

Positive column of a gaseous discharge. B. KLARFELD (Tech. Phys. U.S.S.R., 1934, 5, 913—931).—Using the probe method, the ionisation in the positive column of a Hg-vapour discharge proceeds in a direct, non-cumulative way at pressures of ~0·001 mm., but at higher pressures it is cumulative, particularly at higher current strengths (*I*). For direct ionisation, potential gradient and electron temp. are independent of *I* but they decrease with increasing *I* for the cumulative ionisation. The data are discussed from the viewpoint of the low-pressure plasma theory of Tonks and Langmuir (A., 1929, 1236).

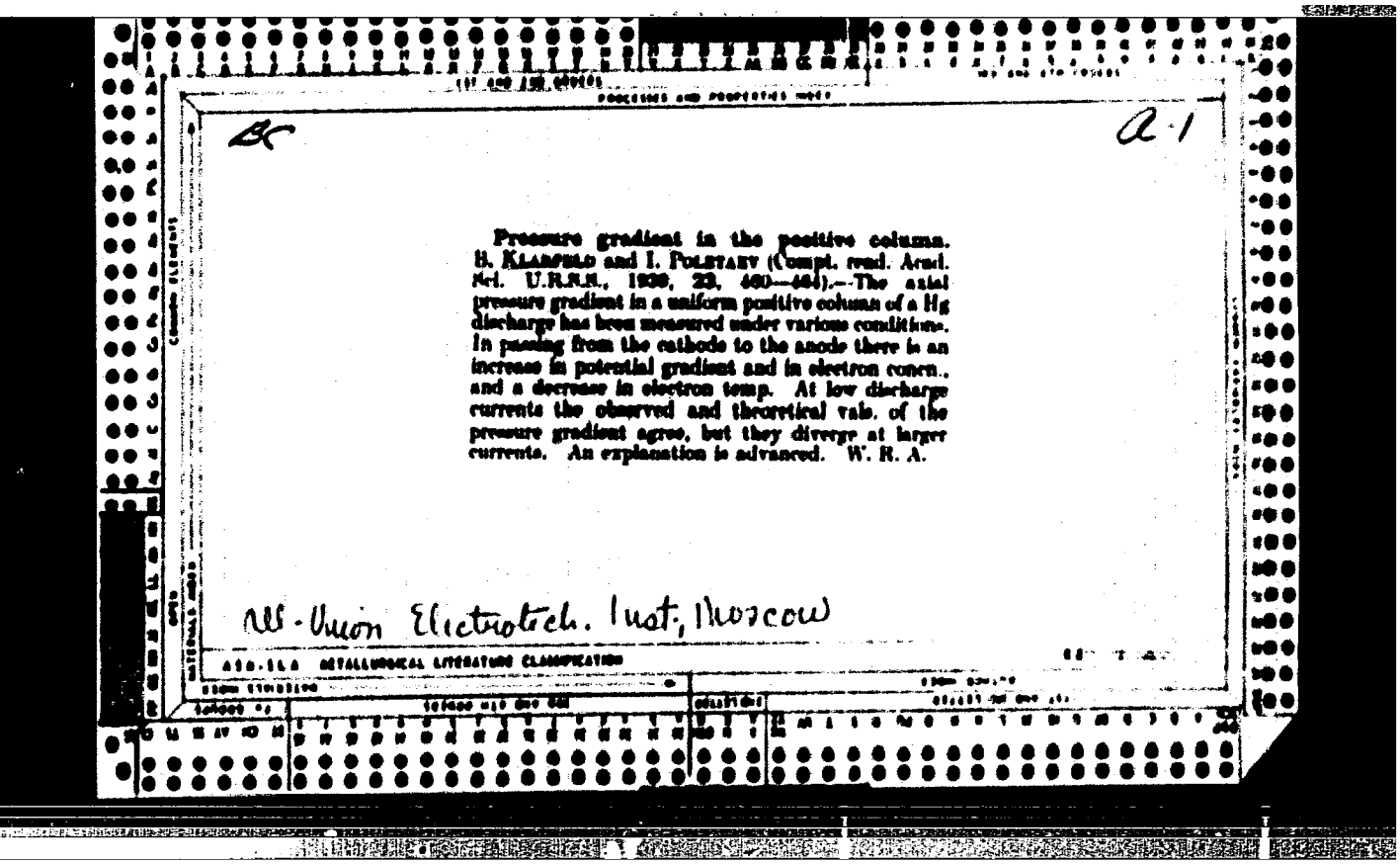
W. R. A.

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION



4196. Influence of the Ramsauer Effect on the Potential Gradient in a Positive Column. B. Klarfeld. *Comptes Rendus (Doklady) de l'Acad. des Sciences, U.S.S.R.* IV. 6-7. pp. 471-474, 1938. *In English.*—Discharges in He, Ne, A, Kr, Hg vapour and K vapour were investigated to find out how the potential gradient in the positive column varies with pressure in general. The gradient was measured by the zero-current probe method in tubes of 20 mm. dia., the discharge currents ranging from 25 to 300 mA. The results obtained for He, Ne, A and Kr with a current of 0·2 A are qualitatively similar and change continuously in one direction on passing from the light to the heavier inert gases. The gradient minimum, at pressures of about 1 mm. of Hg, is deeper in the heavier rare gases. This fact may possibly be attributed to the Ramsauer effect, which is more pronounced in the heavier rare gases. Calculated gradients for He and A agree fairly well with the observed gradients. The absence of a gradient minimum in He and in K vapour may possibly be connected with a decrease of the effective cross-section of He and K atoms with increasing electron velocity. In Hg vapour a slight minimum of the potential gradient is observed. It is pointed out that earlier measurements of the potential gradient and of the values of T_e and [illegible] in Hg vapour would be in better agreement if for Hg there existed a Ramsauer effect for electrons of very low velocities. (See also Abstract 2784 (1937).)

A. W.



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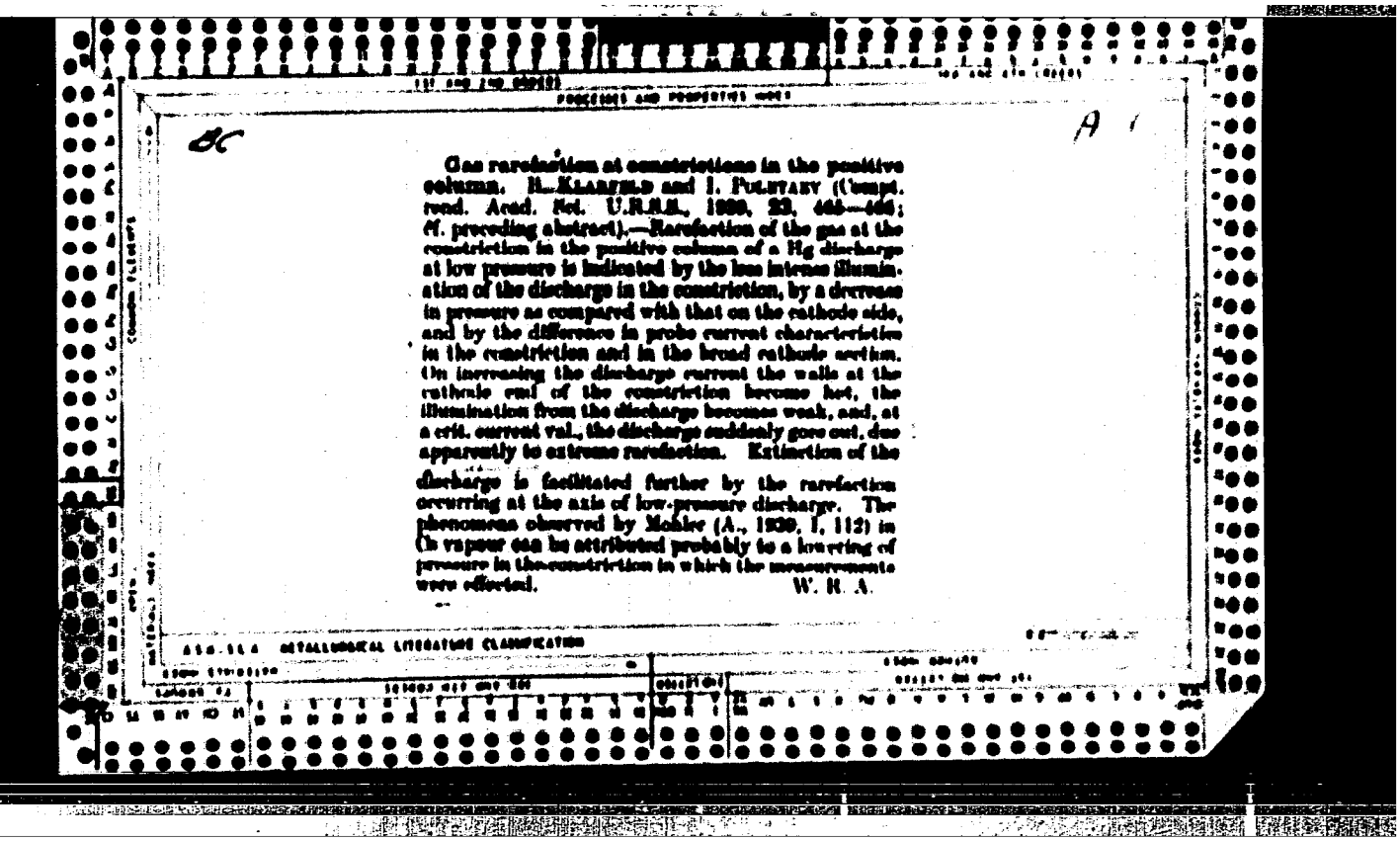
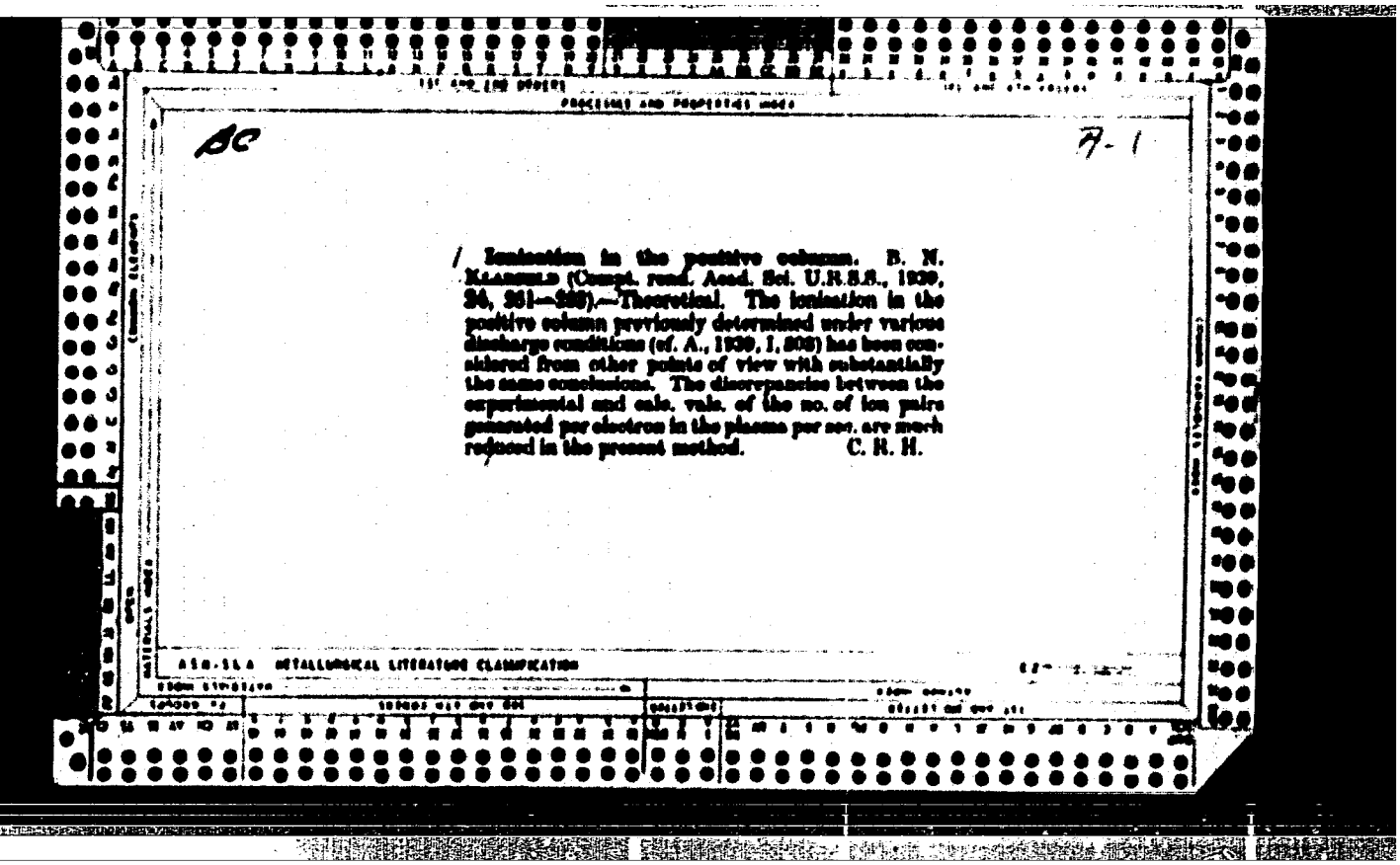
A-1

Pressure gradient in the positive column. B. KLARFELD and I. POLETAEV (Compt. rend. Acad. Sci. U.R.S.S.R., 1939, 23, 460—464).—The axial pressure gradient in a uniform positive column of a Hg discharge has been measured under various conditions. In passing from the cathode to the anode there is an increase in potential gradient and in electron concn., and a decrease in electron temp. At low discharge currents the observed and theoretical vals. of the pressure gradient agree, but they diverge at larger currents. An explanation is advanced. W. R. A.

All-Union Electrotech. Inst., Moscow



Gas rarefaction at constrictions in the positive column. B. KLARFELD and I. PULSTAEV (C'compt. rend. Acad. Sci. U.R.S.S., 1939, 23, 443—446; cf. preceding abstract).—Rarefaction of the gas at the constriction in the positive column of a Hg discharge at low pressure is indicated by the less intense illumination of the discharge in the constriction, by a decrease in pressure as compared with that on the cathode side, and by the difference in probe current characteristics in the constriction and in the broad cathode section. On increasing the discharge current the walls at the cathode end of the constriction become hot, the illumination from the discharge becomes weak, and, at a crit. current val., the discharge suddenly goes out, due apparently to extreme rarefaction. Extinction of the discharge is facilitated further by the rarefaction occurring at the axis of low-pressure discharge. The phenomenon observed by Mohler (A., 1939, I, 112) in Cs vapour can be attributed probably to a lowering of pressure in the constriction in which the measurements were effected. W. R. A.



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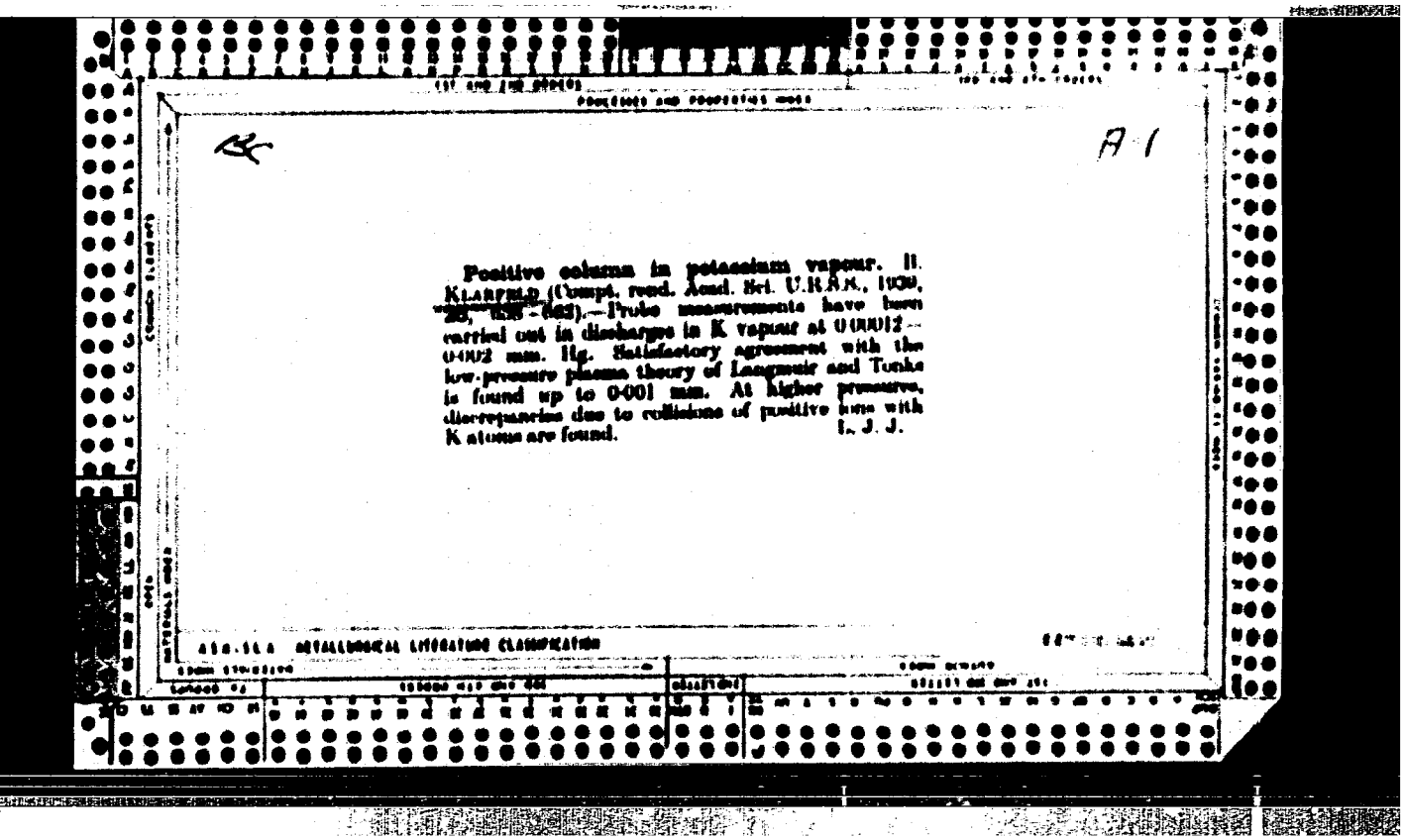
A-1

/ Ionization in the positive column. B. N. KLARFELD (Compt. rend. Acad. Sci. U.R.S.S., 1939, 24, 231—233).—Theoretical. The ionization in the positive column previously determined under various discharge conditions (cf. A., 1939, I, 303) has been considered from other points of view with substantially the same conclusions. The discrepancies between the experimental and calc. vals. of the no. of ion pairs generated per electron in the plasma per sec. are much reduced in the present method. C. R. H.



A 1

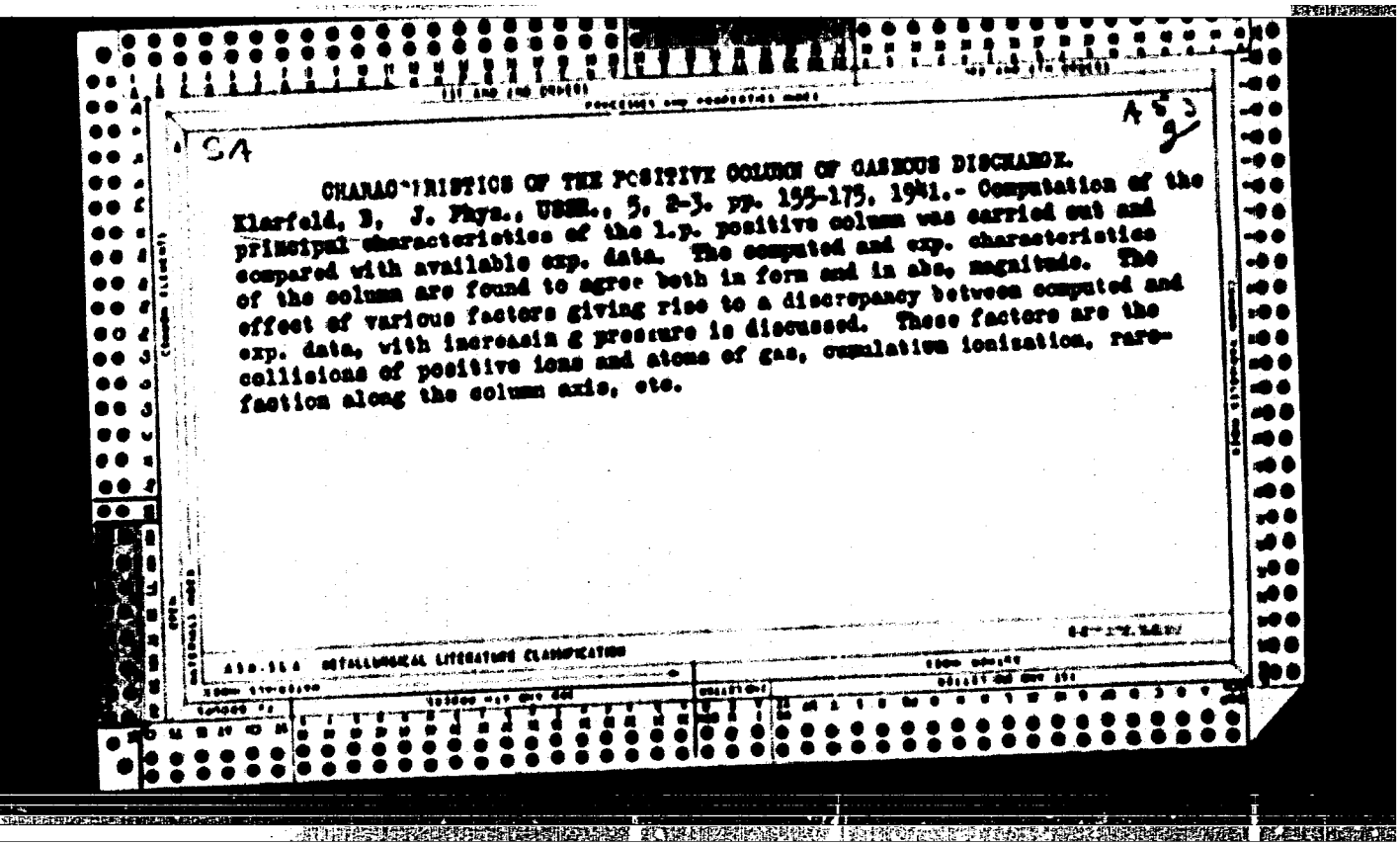
Positive column in potassium vapour. II. KLARFELD (Compt. rend. Acad. Sci. U.R.S.S., 1939, 23, [8], 783-785).—Probe measurements have been carried out in discharges in K vapour at 0·0012–0·002 mm. Hg. Satisfactory agreement with the low-pressure plasma theory of Langmuir and Tonks is found up to 0·001 mm. At higher pressures, discrepancies due to collisions of positive ions with K atoms are found. L. J. J.

A 1 a METALLURGICAL LITERATURE CLASSIFICATION

1812

537.525.8[illegible]

Computation of the Positive Column Characteristics. II. Klarfeld. (C.R. Acad. Sci. U.R.S.S., [illegible], Vol. [illegible], No. [illegible], pp. 573-575. In English.) Deals with the calculation of the discharge characteristics from the atomic properties of the gas. The theory, now freed from previous simplifying assumptions which limited the pressure range, has been extended to cover the whole range within which the low-pressure plasma theory remains valid, and has been confirmed by experiments with mercury vapour. (See [illegible] Granovsky, Bull. Acad. Sci. U.R.S.S., Sér. phys., [illegible], No. 4, p. 410.)



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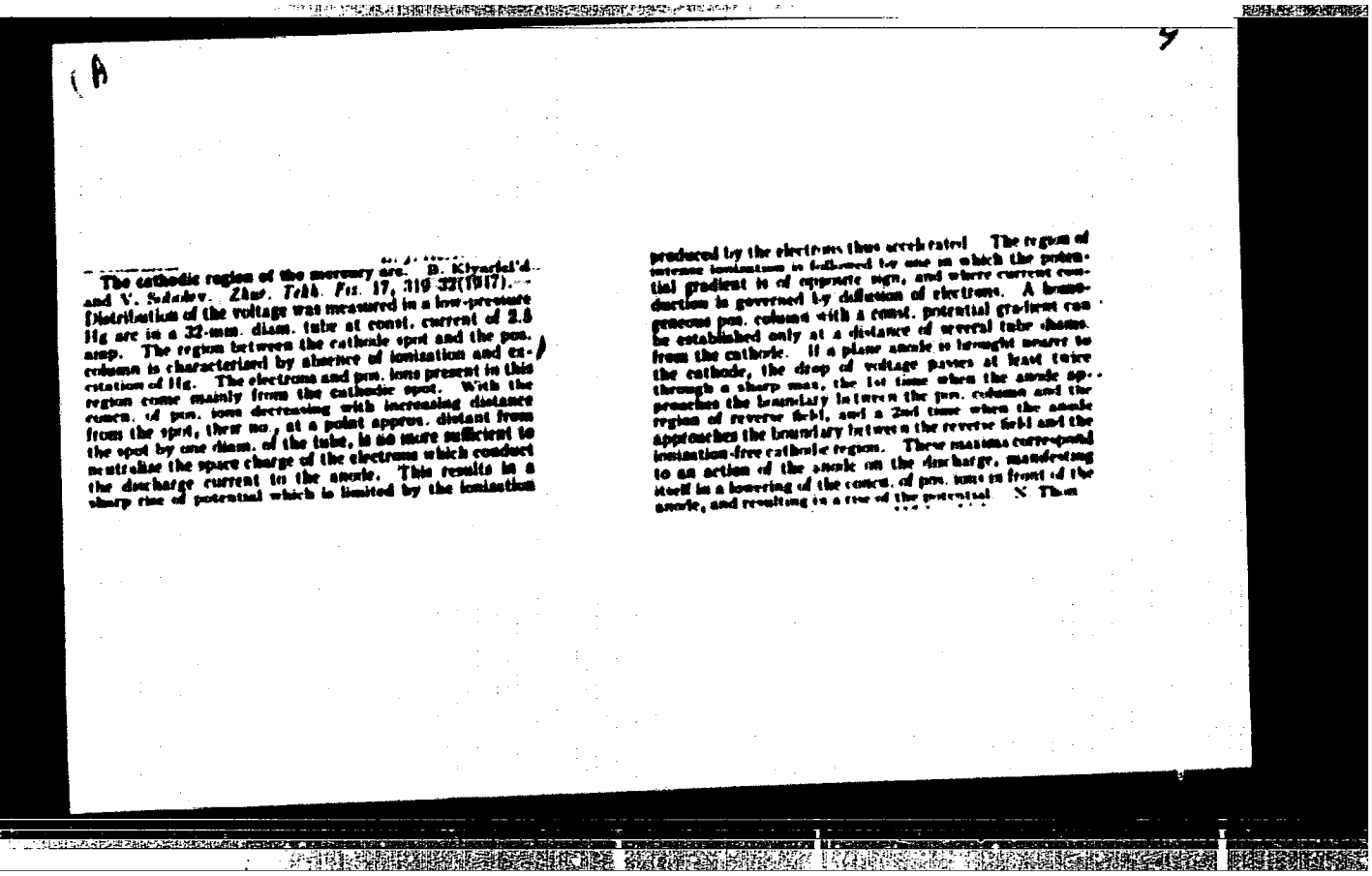
CHARACTERISTICS OF THE POSITIVE COLUMN OF GASEOUS DISCHARGE.

Klarfeld, B. J. Phys., USSR., 5, 2-3, pp. 155-175, 1941.- Computation of the principal characteristics of the l.p. positive column was carried out and compared with available exp. data. The computed and exp. characteristics of the column are found to agree both in form and in abs. magnitude. The effect of various factors giving rise to a discrepancy between computed and exp. data, with increasin g pressure is discussed. These factors are the collisions of positive ions and atoms of gas, cumulation ionization, rarefaction along the column axis, etc.



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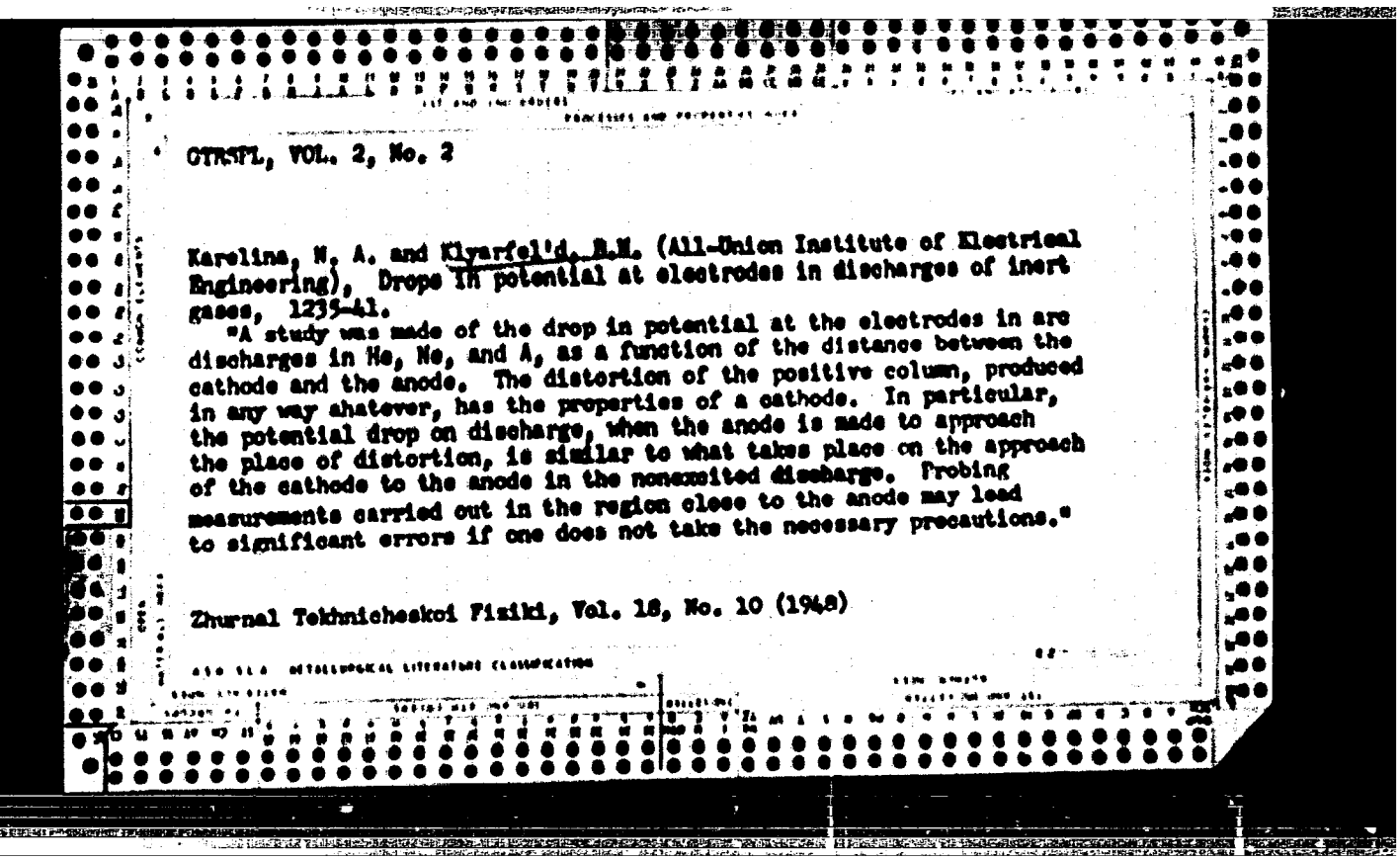
The cathodic region of the mercury arc. D. Klyarfeld and V. Sokolov. *Zhur. Tekh. Fiz.* 17, 319-32(1947).—Distribution of the voltage was measured in a low-pressure Hg arc in a 32-mm. diam. tube at const. current of 2.5 amp. The region between the cathode spot and the pos. column is characterized by absence of ionization and excitation of Hg. The electrons and pos. ions present in this region come mainly from the cathodic spot. With the concn. of pos. ions decreasing with increasing distance from the spot, there no, at a point approx. distant from the spot by one diam. of the tube, is no more sufficient to neutralize the space charge of the electrons which conduct the discharge current to the anode. This results in a sharp rise of potential which is limited by the ionization produced by the electrons thus accelerated. The region of intense ionization is followed by one in which the potential gradient is of opposite sign, and where current conduction is governed by diffusion of electrons. A homogeneous pos. column with a const. potential gradient can be established only at a distance of several tube diams. from the cathode. If a plane anode is brought nearer to the cathode, the drop of voltage passes at least twice through a sharp max., the 1st time when the anode approaches the boundary between the pos. column and the region of reverse field, and a 2nd time when the anode approaches the boundary between the reverse field and the ionization-free cathodic region. These maxima correspond to an action of the anode on the discharge, manifesting itself in a lowering of the concn. of pos. ions in front of the anode, and resulting in a rise of the potential. N. Thon

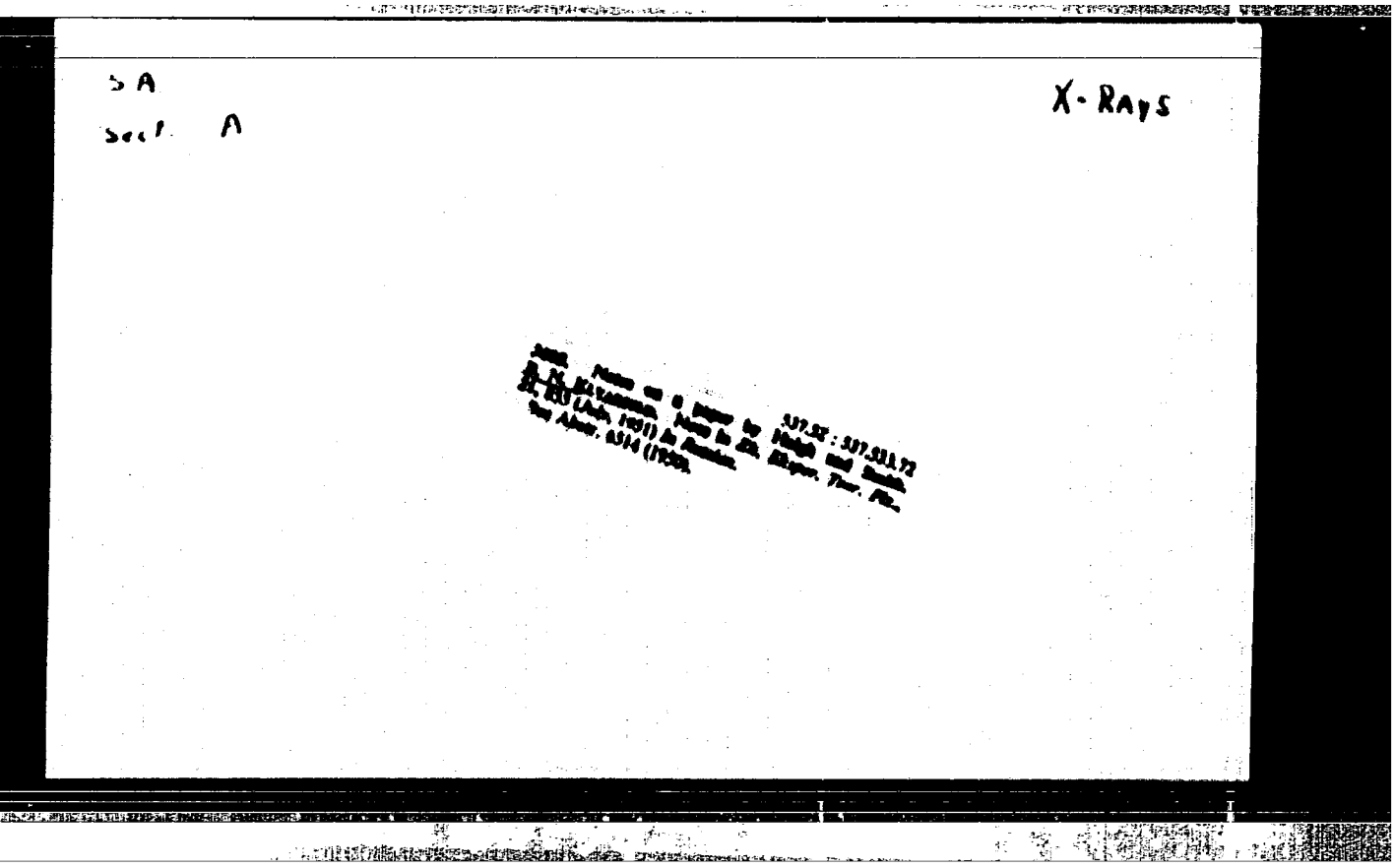


GTRSTL, VOL. 2, No. 2

Karelina, N. A. and Kiyarfel'd, E.M. (All-Union Institute of Electrical Engineering), Drops in potential at electrodes in discharges of inert gases, 1235-41.

"A study was made of the drop in potential at the electrodes in arc discharges in He, Ne, and A, as a function of the distance between the cathode and the anode. The distortion of the positive column, produced in any way whatever, has the properties of a cathode. In particular, the potential drop on discharge, when the anode is made to approach the place of distortion, is similar to what takes place on the approach of the cathode to the anode in the nonexcited discharge. Probing measurements carried out in the region close to the anode may lead to significant errors if one does not take the necessary precautions."

Zhurnal Tekhnicheskoi Fiziki, Vol. 18, No. 10 (1948)



KLYARFEL'D, B. N.

USSR/Physics - Gas Discharge Jan 52

"The Formation of Strata in Gas Discharge," B. N. Klyarfel'd, All-Union Elec-Tech Inst

"Zhur Eksper i Teoret Fiz" Vol XXII, No 1, pp 66-77

Study of the conditions governing the formation of strata (striae) indicates that they occur for such pressures that not less than 10 collisions of an electron with mols of the gas occur between the heads of neighboring strata (striae). Submitted 8 Mar 51.

204T104

KLYARFELD, B. N.

USSR/Physics - Electric discharge FD-892

Card 1/1 Pub 153-1/26

Author : Guseva, L. G. and Klyarfeld, B. N.

Title : Voltage of discharge flash in mercury vapors

Periodical : Zhur. tekh. fiz. 24, 1169-1178, Jul 1954

Abstract : Analysis of elementary processes at low pressures showed a satisfactory agreement between the constants of these processes and the behavior of the left branch of the flash curve. In the region of 300-8000 volts the curve of flash voltages exhibits a complex bend similar to that found by F. Penning (Proc. Amst. Acad., 34 1305 (1931) for helium. Indebted to A. V. Rybchinskiy. Twenty references including 12 foreign.

Institution : --

Submitted : February 1, 1954

USSR/Physics - Ignition

Card 1/2 Pub. 153 - 9/24 FD-3110

Author : Dikidzhi, A. N.; Klyariel'd, B. N.

Title : Ignition voltage of discharge in He, Ni, Ar, Kr, and Xe at lov pressures

Periodical : Zhur. tekh. fiz., 25, No 6 (June), 1955, 1038-1044

Abstract : The authors investigate the left branches of the Paschen curves in the inert gases He, Ne, Ar, Kr, and Xe up to values of ignition voltage equal to 40-45 kilovolts. The material of the cathode and anode are nickel and graphite. They consider the influence of various elementary processes upon the position and shape of the curves of ignition. They confirm experimentally the earlier expressed assumption concerning the essential role of the material of the anode. Conclusions: Rather stable values of ignition voltages of discharge are obtained on cold nickel cathode subjected ("trained") by high voltage; prolonged tempering of the cathode in vacuuo at 800°C does not noticeably change these values. Ignition curves in homogeneous field for Ar, Kr, and Xe almost coincide; Ne and especially He possess considerably higher ignition voltages. Discharge ignition voltages in inert gases are greater for graphite cathode than for nickel cathode. Substitution of nickel by graphite as anode material increases ignition voltages more than a similar

substitution of cathode material, the cause for this being the decrease in number of ionizations by electron collisions occurring in discharge gap by electrons reflected from the anode.

Institution :

Submitted : January 20, 1955

Physics - Discharge gas density

Card 1/2 KLYARFEL'D, B. N. Pub. 153 - 8/19 FD-3133

Author : Klyarfel'd, B. N.; Timofeyev, A. A.; Neretina, N. A.; Guseva, L. G.

Title : Characteristics of probes at positive potentials and measurement of density of gas in discharges

Periodical : Zhur. tekh. fiz., 25, No 9 (September), 1955, 1581-1596

Abstract : The authors review the discharge phenomena near a probe that has a positive potential relative to the plasma. Utilization of certain properties of the volt-ampere characteristics of such a probe permit them to measure the variation of the gas density under the action of discharge fed by a direct or alternating current. They find that with increasing positive potential on the probe relative to gas-discharge plasma the volt-ampere characteristics of the probe indicate the existence of two regimes: a) regime of probe corresponding to non-independent form of discharge, and b) regime of anode corresponding to independent discharge able to exist even when the main discharge is switched off; the transition between the two regimes of probe operation is effected in most cases by a jump suggestive of the phenomenon of rupture. Difference in potentials between plasma and positively charged probe at which rupture of layer near probe occurs increases with decrease in the density of the gas and with increase in density of discharge current; these properties can be used to measure the gas density in the limits of intense discharge, and suggests a convenient method for measuring

densities in various gases and vapors. The region of measurements of gas densities can be regulated by changes in the radius of the cylindrical probe used, since the rupture strength of the layer increases with decrease in radius; this is the result of decrease in the thickness of that part of the layer near the probe in which the electrons produce intense ionization of the gas. Comparatively small increase in probe current in the positive branch of the characteristics of a plane probe is mainly determined by increase in plasma of ions generated in the layer; recharging of positive ions amplifies this effect by several times. Transition of the probe to the anode regime is accompanied by formation around the probe of a new intense plasma of small size separated from the remaining plasma by a potential drop. Ordinarily this regime is unstable and the probe passes continuously from the anode regime to the probe regime and reversely, thus forming deep oscillations in the voltage strength with frequency of 10^4 to 10^6 cycles. The proposed mechanism governing these oscillations consists in the periodic accumulation of positive ions around the probe with formation of new small plasma and in the disintegration of this plasma after the voltage at the probe drops to a small value. For the study of dynamic variation of gas density in discharges the authors developed an impulse probe method permitting measurement of instantaneous values of gas density in various phases of discharge burning on alternating or periodic current. Nineteen references: e.g. B. Klyarfeld, L. Pervova, Ibid., 15, 640 1945; V. Granovskiy, T. Suyetin, ibid., 16, 1023, 1946 and 17, 291, 1947; etc.

Submitted : March 22, 1955

KLYARFEL'D, B.N.

SUBJECT USSR / PHYSICS
AUTHOR KLJARFEL'D,B.N., FRID,A.A.
TITLE A Filamentlike Anode in a Gas Discharge.
PERIODICAL Zurn.techn.fis, 26, fasc.11, 2541-2547 (1956)
Issued: 12 / 1956

CARD 1 / 2 PA - 1689

Here the experimental investigation of the ignition mechanism of the discharge in a long discharge tube along the axis of which a thin wire is drawn, is described. The application of a potential, which is positive with respect to the cathode, to the filament causes a discharge luminescence on the surface of the filament as well as the instant ignition of the discharge between the main electrodes. In mercury vapors (p = 0,001 mm torr in the case of discharge currents of the order from 10^{-5} to 10^{-3} amperes on the filament) a weak luminescence extends over the surface of the filament to the extent of up to 75 cm. However, a reliable discharge is attained only if the discharge tube is not very long. That portion of the filament which is next to the cathode is the anode of the independent discharge. The remaining part of the filament collects the electrons which are propagated from the domain of the independent discharge. These electrons penetrate into the cylindrical field between the walls of the tube and the field, describe several circles round the filament, and then impinge upon the filament. Near the filament the electrons have the highest kinetic energy and ionize the gas intensely. On this occasion a noticeable concentration of electrons and positive ions is brought about in

KLYARFELD, S. N.

AUTHOR: POKROVSKAYA-SOBOLEVA, A.S., KLYARFELD, S.N. 56-5-8/55

TITLE: Ignition of a High-Voltage Discharge in Highly Diluted Hydrogen. (Zazhiganiye vysokovoltnoy formy razryada v vodorode pri bol'shikh razrezheniyakh, Russian)

PERIODICAL: Zhurnal Eksperim. i Teoret. Fiziki, 1957, Vol 32, Nr 5, pp 993 - 1000 (U.S.S.R.)

ABSTRACT: The newly constructed discharge tube was available in two shapes: in one case the electrodes were firmly mounted, and in the other the distance between them could be varied from 4 to 32 cm by moving one of the electrodes. The nickel electrodes had a diameter of 80 mm, so that the field forming between the electrodes was sufficiently homogeneous.

Before being used the polished electrodes were hardened in the vacuum by high frequency hardening.

The hydrogen pressure was regulated by means of the heating of titanium hydride which was embedded in the discharge tube. The well smoothed high voltage was supplied by a rectifier and could be regulated without steps from 0 - 40 kV. The high-voltage form of discharge which forms in the left part of the Paschen curve after ignition is distinguished by the fact that the voltage loss on the electrodes is independent of amperage. In particular,

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KLYARFELD, B. N.

"The Ignition in Highly Rarefied Gases."

paper presented at Second All-Union Conference on Gaseous Electronics, Moscow, 2-6 Oct '58.

FOTIN, V.P.; AKOPYAN, A.A.,red.; ANDRIANOV, K.A.,red.; BIRYUKOV, V.G.,glavnyy red.; BUTKEVICH, Yu.V.,zamestitel' glavnogo red.; GRANOVSKIY, V.L., red.; KALITVYANSKIY, V.I.,red.; KLYARFELD, B.N.,red.; KRAPIVIN, V.K., red.; TIMOFEYEV, P.V.,red.; FASTOVSKIY, V.G.,red.; TSEYTROV, Ye.M., red.; SHEMAYEV, A.M..red.; DEMKOV, Ye.D.,red.; FRIDKIN, A.M.,tekhn. red.

[Voltage increase on long a.c. lines during nonsymmetric short circuits to ground] Povyshenila napriazhenii v dlinnykh liniiakh peremennogo toka pri nesimmetrichnykh korotkikh zamykaniiakh na zemliu. Moskva, Gos.energ.izd-vo, 1958. 223 p. (Moscow. Vsesoiuznyi elektrotekhnicheskii institut. Trudy, no.64) (MIRA 12:2)
(Electric lines) (Short circuits)

AUTHORS: Klyarfel'd, B. N., Neretina, N. A. 57-2-10/32

TITLE: The Anode Region in Gas Discharge at Low Pressures (Anodnaya oblast' v gazovom razryade pri nizkikh davleniyakh)
I. The Influence of the Anode Mold on the Sign and the Quantity of the Anode Fall (I. Vliyaniye formy anoda na znak i velichinu anodnogo padeniya)

PERIODICAL: Zhurnal Tekhnicheskoy Fiziki, 1958, Vol. 28, Nr 2, pp.296-315 (USSR)

ABSTRACT: The phenomena at the anode in mercury discharge were here investigated for the 3 most characteristic cases: a hollow cylindrical anode, a semispherical anode with a diameter equal to 0,3 of the column diameter and a flat anode filling the entire column cross section. The investigations were performed at pressures of below 0,1 mm torr. (i.e. in the absence of a marked discharge concentration in the column or at the anode) and in the range of discharge-currents from 0,03-10 A, at a column diameter of 32 mm. The hollow and semi-spherical anode in all cases possess a negative and positive sign of

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The Anode Region in Gas Discharge at Low Pressures. I. The Influence of the Anode Mold on the Sign and the Quantity of the Anode Fall

the anode fall respectively. A heating of these anodes to 700-800°C does not cause a change of the quantity or the sign of the anode fall. Summarizing the authors state: 1) The sign of the anode fall is determined by the conditions for a generation and for the disappearance of the positive ions in the region of the anode. In those cases where these conditions favor the formation of the concentration of positive ions which are sufficient for the neutralization of the space charge of the electrons transferring the discharge-current to the anode, no anode fall occurs or it has a small negative value. In the case of a deficiency of positive ions a positive anode fall forms. 2) An anode of small dimensions near which the positive ions are dispersed under the simultaneous influence of the diffusion and the electric field is in all cases characterized by the positive anode fall of considerable amount and by the development of supersonic frequency--variations in the anode region. The hollow anode which is filled with positive anodes of long life is characterized by a negative anode fall up to mercury-vapor-pressures of 0,1 mm (higher up the contraction of the discharge begins). 3) The

57-2-10/32

The Anode Region in Gas Discharge at Low Pressures. I. The Influence of the Anode Mold on the Sign and the Quantity of the Anode Fall

flat front-anode which fills the entire cross section of the discharge is characterized by a negative anode fall at pressures up to 0,01 mm and by a positive anode fall at $p > 0,01$ mm. In the latter case the anode fall only remains constant in discharge-currents of below 1 A (diameter of the tube = = 32 mm). The reason for the change of sign of the anode fall on a rise of pressure lies in the deterioration of the conditions for the retention of the high concentration of positive ions. In a cold state the flat anode mainly has a negative anode fall. 4) The investigation of the space in front of the flat front-anode by means of probes showed that the selection of the ionic currents directed toward the anode through the anode creates a zone with diminished concentration of charged particles and diminished brightness. In the presence of a negative anode fall in the section of the positive column lying against the anode a flat concentration-maximum of the charged particles occurs on a length of 4 - 5 column diameter. In a positive anode fall the disturbance of the homogeneity of the column begins in a distance from the anode with an order of

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The Anode Region in Gas Discharge at Low Pressures. I. The Influence of the Anode Mold on the Sign and the Quantity of the Anode Fall

magnitude beginning from one column-diameter. 5) The analysis of the phenomena in the negative anode fall shows that the quantity of the anode fall increases with the increase in the electron-temperature and with the increase in the relation of the density of the random ionic current to the density of the discharge-current. Both conditions are satisfied in the plasma of a discharge between an annealed thread emitting electrons and a coaxial cylindrical anode. In a number of inert gases it was found that in a similar kind of discharge under pressure of the order of magnitude 10^{-4} - 10^{-3} mm the electron-temperature-values attain 150-200 000°K, whereas the relation of the densities of the disordered ionic current and the discharge-current is equal to several dozens. The negative anode falls measured according to the method of probes on that occasion attained 40-50 V. There are 14 figures, 2 tables, and 20 references, 11 of which are Slavic.

ASSOCIATION: All-Union Institute of Electro-Engineering imeni V. I. Lenin, Moscow (Vsesoyuznyy elektrotekhnicheskiy institut im. V. I. Lenina, Moskva)

SUBMITTED: May 20, 1957
AVAILABLE: Library of Congress
Card 4/4

1. Anodes-Phenomena 2. Gases-Discharge 3. Mercury

SOKOLOV, Nikolay Nikolayevich; ANDRIANOV, K.A., red.; AKOPYAN, A.A., red.; BIRYUKOV, V.O., glavnyy red.; BUTKEVICH, O.V., red.; GRANOVSKIY, V.L. red.; GERTSENBERG, G.R., red.; ZABYRINA, K.I., red.; KALITVYANSKIY, V.I., red.; KLYARFEL'D, B.M.; SAKOVICH, A.A.; TIMOFEYEV, P.V.; FASTOVSKIY, V.G.; TSYTKOV, Ye.N.; FRIDMAN, A.Ya.; SHEMAYEV, A.M.; TIMOKHINA, V.I., red.

[Methods for the synthesis of organopolysiloxanes] Metody sinteza poliorganosiloksanov. Moskva, Gos.energ. izd-vo. 1959. 198 p. (Moscow. Vsesoiuznyi elektrotekhnicheskii institut. Trudy, no.66) (MIRA 12:5)

(Siloxanes)

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24.2100 SOV/109-4-8-15/35

AUTHORS: Neretina, N.A. and Klyarfel'd, B.N.

TITLE: Formation of Light ~~Spots on the Anode~~

PERIODICAL: Radiotekhnika i elektronika, 1959, Vol 4, Nr 8, pp 1301 - 1305 (USSR)

ABSTRACT: When the positive anode fall U_a and the gas pressure p reach certain values, it is found that bright light spots are formed on the uniform layer of the anode glow. It has been found that in mercury-vapour discharges, these values are U_a = 7-8 V, p = 0.003 mm Hg. When the spot is formed, the anode voltage fall changes discontinuously and is reduced to 2 - 4 V. When the pressure is further increased, the spot is reduced and a number of new spots appear; these form regular patterns on the surface of the anode. In spite of extensive experimental data on the anode spots, their nature is not as yet understood. The authors investigated the properties of the plasma inside the individual anode spots. This was done by employing a small probe which could be introduced into a spot through

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a narrow slot cut in the anode. Figure 1 shows the change U_o of the voltage fall on a discharge and the change of the positive potential fall ΔU of the anode as a function of the current in the anode region. The figure shows that the formation of the spot leads to the breakdown of the layer of the negative space charge in the vicinity of a given section of the anode. The values of the discharge current and the gas pressure at which the spots appeared were investigated for a hydrogen discharge produced on a flat anode. The diameter of the experimental tube was 50 mm. The results of the measurements are shown in Figure 2. The numbers by the various curves denote the number of spots. It was found that the spots appear only within a definite region of pressures. At comparatively high pressures, the spots become blurred and finally disappear. The pressure at which the spots exist are as follows: 0.003 to 1 mm for mercury; 0.15 to 5 mm for hydrogen and a few mm to about 200 mm for neon and helium. The mechanism of the spot formation can be explained as

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follows. Under the conditions leading to the increase of the anode fall and at a sufficiently high pressure, the density of the ion generation is so high that a new plasma in the form of a fine film is formed near the surface of the anode. The existence of the plasma film is unstable. Probe measurements have shown that the potential inside the spots is a few volts higher than the anode potential. By employing a cathode oscillograph, it was found that intense oscillations with ultrasonic frequencies were produced in the double layer situated between the positive column and the spot. On the other hand, the oscillations in the ionic layer between the spot and the anode surface are comparatively weak. When the anode dimensions are small and the gas pressures are low, the anode is fully enveloped by the spot which then has the form of a glowing sphere. In this case, oscillations having a comparatively high amplitude and a frequency in the ultrasonic range are obtained at the anode. An approximate potential distribution in the vicinity of the anode during the various stages of the oscillation is

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indicated in Figure 4.
There are 4 figures and 10 references, 2 of which are German, 2 English and 6 Soviet.

SUBMITTED: March 5, 1959

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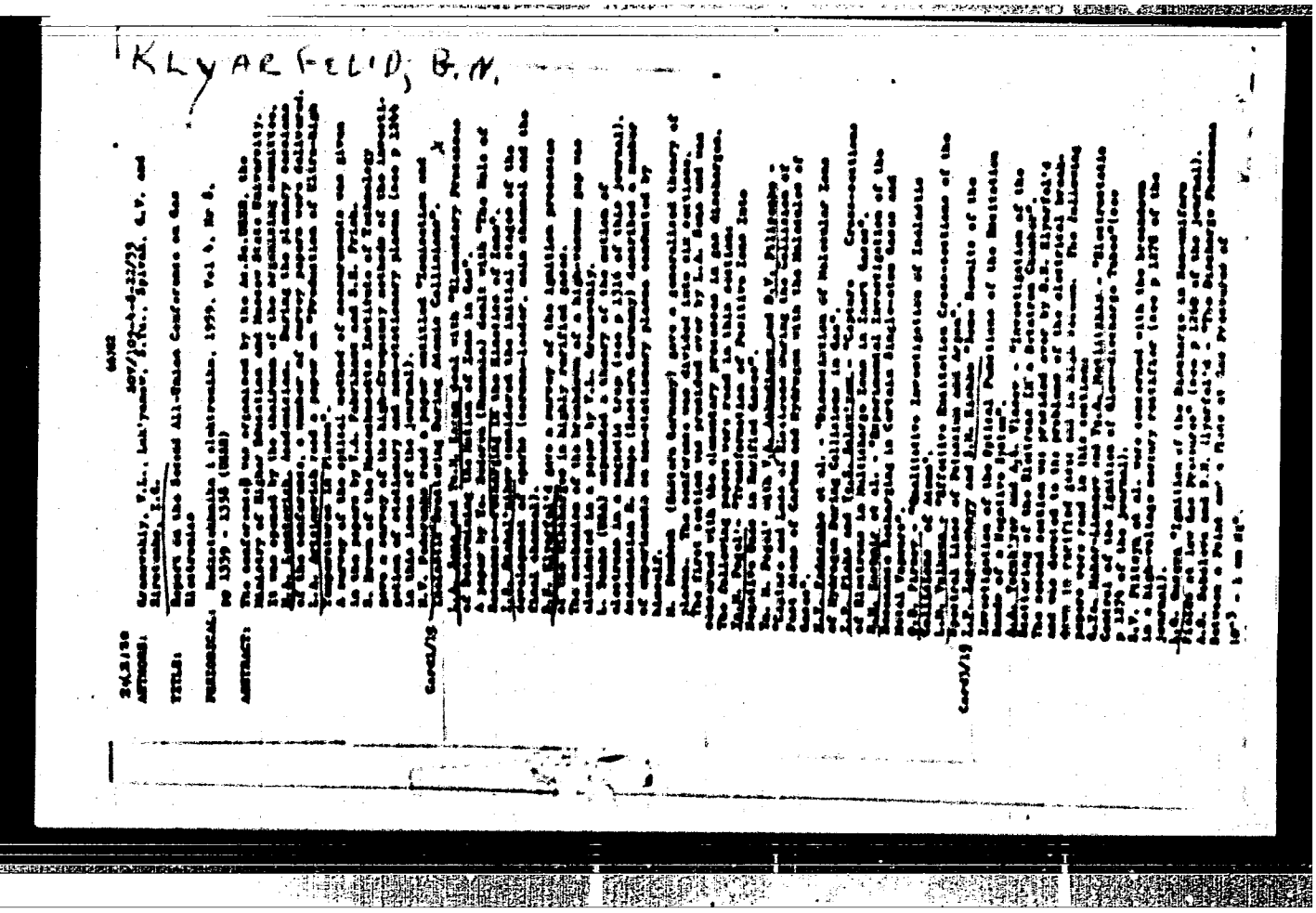
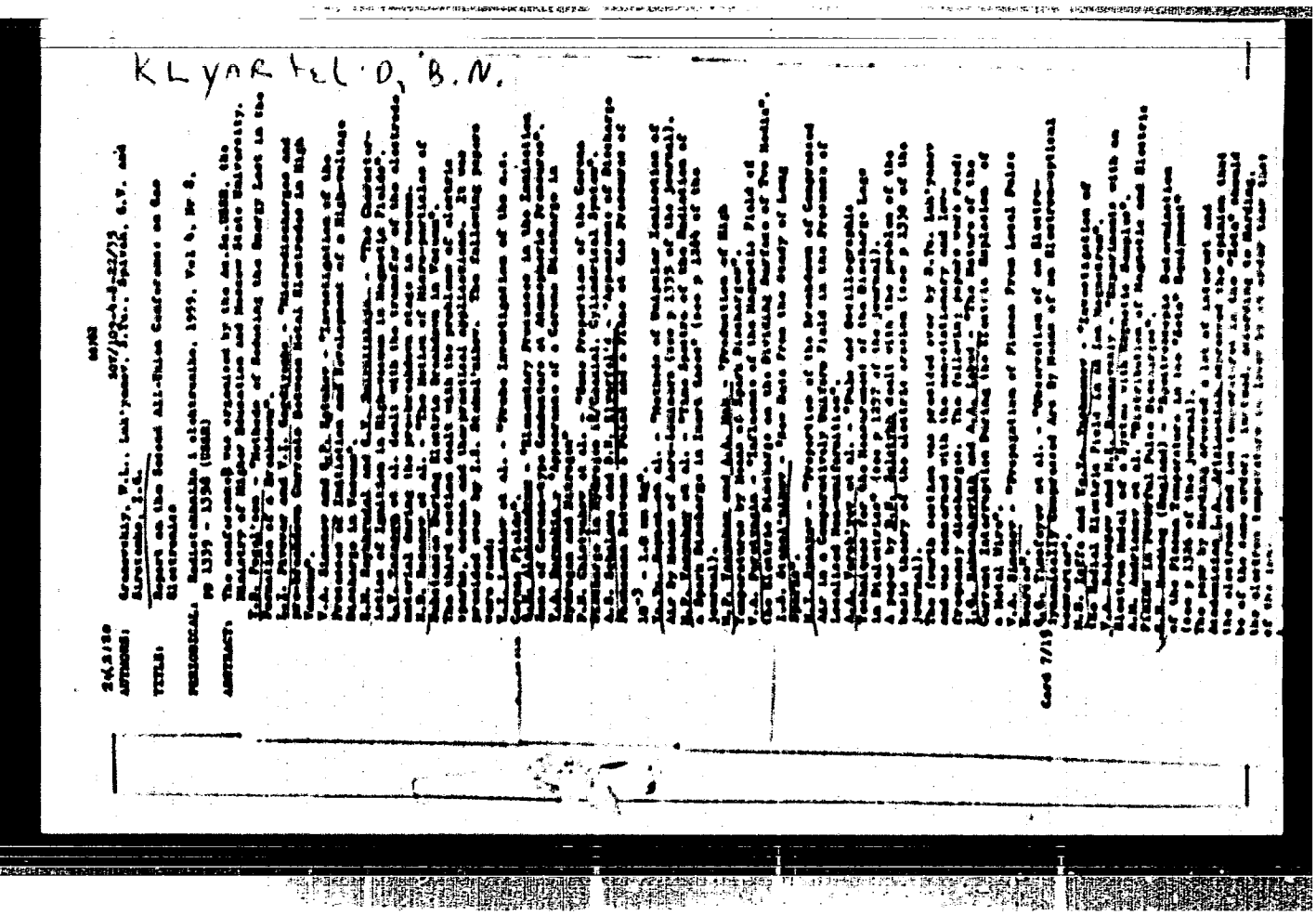
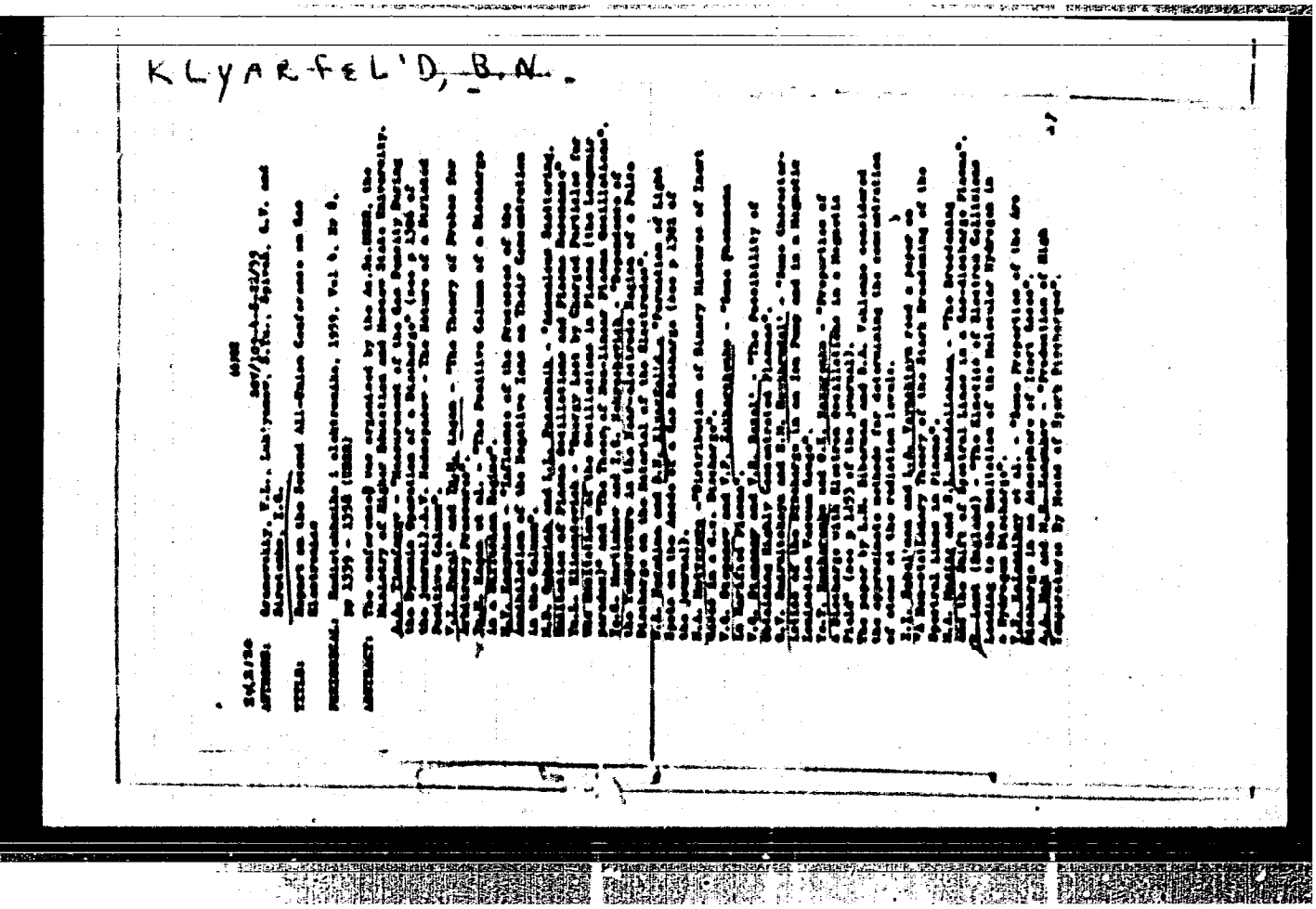


KLYARFELD, B.N.



KLYNAFELD, B.N.



KLYARFELD, B.N.

MERETINA, M.A.; KLYARFEL'D, B.N.

Anode region in gaseous discharges at low pressures. Part 2: Effect of the temperature of plasma electrons, the temperature of the anode surface, and the accomodation coefficient of molecules on the anode. Zhur.tekh.fiz. 29 no.1:15-23 Ja '59. (MIRA 12:4)

1. Vsesoyuznyy elektrotekhnicheskiy institut im. V.I. Lenina, Moskva.

(Gases, Ionized)

9.3150,24.2120

T7312
SOV/57-30-2-9/18

AUTHORS: Klyarfel'd, B. N., and Neretina, N. A.

TITLE: The Anode Region in Low Pressure Gaseous Discharge. Part III. The Appearance of Supplementary Plasmas on the Anode (Anode Spots) ((I) ZhTF, XXVIII, 296, 1958; (II) ZhTF, XXIX, 15, 1959)

PERIODICAL: Zhurnal tekhnicheskoy fiziki, 1960, Vol 30, Nr 2, pp 186-198 (USSR)

ABSTRACT: For a positive anode voltage drop, the film of the discharge glow covers usually the anode uniformly. However, when the pressure exceeds a value characteristic for a given gas and the anode current density is kept above 10^{-3} to 10^{-2} a/cm^2, a bright hemispherical spot is formed over the background of the anode glow. With the further increase of pressure there is an increase in number of spots and their relative brightness while the radius of a single spot decreases. For particular values of pressure and current many sharply outlined

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spots cover the anode with regular patterns. At still higher pressures these spots disappear again. The authors review various explanations for the appearance of these spots given by researchers during last 35 years and conclude that the final answer about the nature of these spots is still far away. In the present paper they present investigations in vapors of mercury, in inert gases, and in hydrogen. Introducing probes into the spots from the anode side they managed to investigate directly the properties of spots. The regular patterns of spots were explained by the inverse influence of each spot on the discharge region surrounding it. To investigate the conditions for occurrence of spots the authors performed tests on Hg vapor for various values of pressure p, anode voltage drop U_a, current I, and the temperature of the anode T_a. Results are on Fig. 1. Single line curves are obtained in absence of spots; the double line with one spot present. The relationship between the pressure and the number of spots was found using hydrogen discharge which produces many and stable spots. Results are on Fig. 2.

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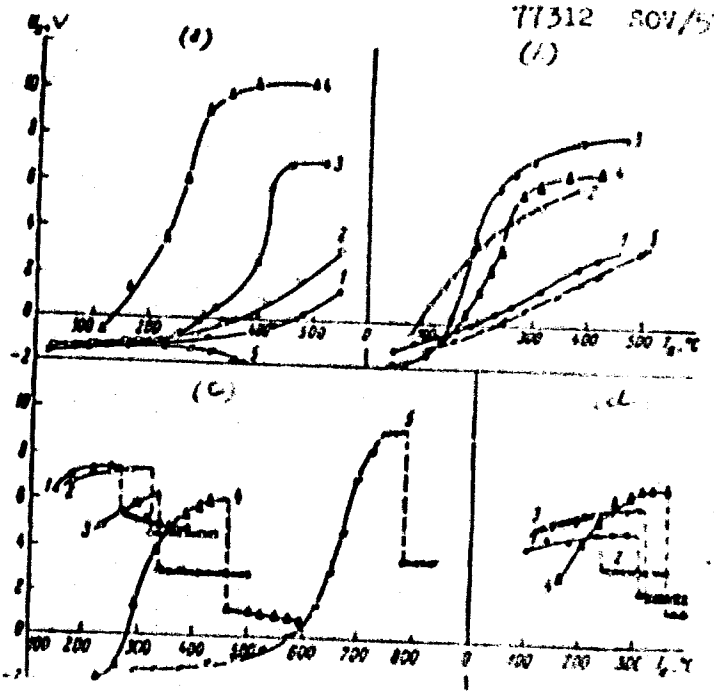

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Fig. 1. Occurrence of spots for various values of i, p, T_a, and H_a. (a) p = 0.001 mm Hg; (b) p = 0.003; (c) p = 0.01; (d) p = 0.08 mm Hg. Values of the discharge current: (1) 0.1a; (2) 0.3 a; (3) 1 a; (4) 3 a; (5) 10 a.

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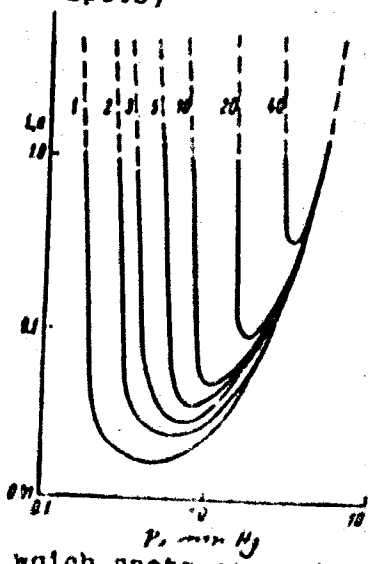
Fig. 2. The relationship between the number of spots and i and p in hydrogen. Number of spots is indicated next to each curve.



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The pressure regions in which spots can exist are different for different gases. The authors found

that the current density on the anode decreases from the center toward outer boundary. The current density on a spot is at most twice as strong as one the rest of the anode. To investigate the spots themselves, the authors used an anode arrangement as on Fig. 4. A_1 is the basic anode; A_2 - its central region with separate connection; S_1 - probe made of tungsten wire 0.1 mm in diameter, with a 0.4 mm sphere at its end, 1.5 mm in front of A_2. S_2 was inside the positive column and served to determine the anode voltage drop. Table A contains t the results obtained. i_1 and i_2 are currents on A_1 and A_2, respectively. u_1 is the potential drop between S_2 and the spot u_2 between the spot and A_2. Δu is the potential difference between A_2 and A_1

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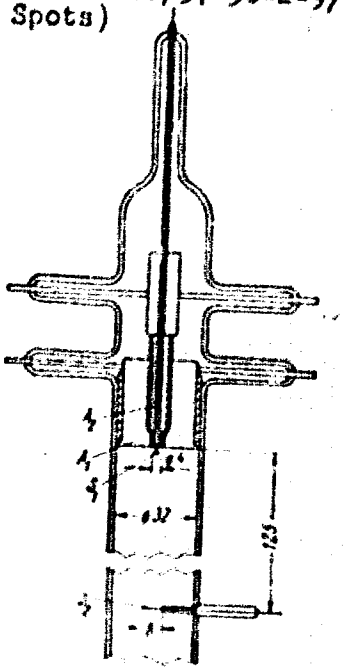

Fig. 4. Discharge tube for probe measurements inside the anode spot.

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Table A. Discharge in Mercury Vapors. Anode Diameter 32 mm; Diameter of its Central Part 4 mm.

№	p, mmHg	i_a, a	i_e, a	U_a, v	U_k, v	U_i, v	T_e', °K	T_e, °K	K
1	0.009	2	0.100	+11.3	−15	3	63,000	20,500	3.1
2	0.003	0.5	0.035	+13.7	−30	7	76,000	27,000	2.8
3	0.006	0	0.100	+20	−20	-	72,000	20,100	3.6

necessary to keep the spot on A_2. T_e' and T_e are electron temperatures in the spot and column, respectively. The authors note the relative constancy of the T_e'/T_e ratio. In connection with these temperatures the authors discovered the cause of large influence of the spots on the general

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discharge. To calculate K, the average ionization rate per electron, they developed an equation

$$\alpha = AB p_0 \left(\frac{\varepsilon_0}{e\varepsilon_i}\right)^{1/2} U^{1/2} e^{-\frac{\varepsilon_i}{U}} \left[\frac{U}{(1+BU)^3} + \frac{U+U_i}{1+BU}\right] \qquad (2)$$

using approximation for the effective ionization curves given by Klyarfel'd (J. of Phys. USSR, 5, 155, 1941). Here $U = \frac{kTe}{e}$, and substituting the temperature values one finds that K in the spot is 50 times larger than the K in the positive column. This was verified experimentally by discovering that 10% of the total current originating on A_2 (and the spot) was sufficient to destroy completely the positive anode potential drop due to the large ion production inside the spot. In addition, the authors concluded after performing appropriate tests that the degasing of the anode, the the electron reflection from the anode, and the decrease of inelastic energy losses with an increase of pressure

cannot be the decisive factors for the occurrence of the spots. On the basis of all the above they propose the following mechanism: An initial large anode voltage drop and sufficiently high gas pressure are the simultaneous necessary conditions for a large density of positive ion generation. When this ion generation reaches some critical value, a new plasma starts to develop in the form of a thin uniform layer whose potential exceeds that of the anode for a few volts. This state is, nevertheless, unstable, and a small nonuniformity in ion leads to a process exemplified on Fig. 7. The authors further investigate the influence of single spots on their surroundings and the condition allowing the simultaneous existence of many spots. With an increase in pressure the radius of action of single spots decreases, allowing creation of new spots with identical properties with respect to the discharge and, therefore, spaced in a regular pattern. Still higher pressure reduces the size and thickness of the spots to the thickness

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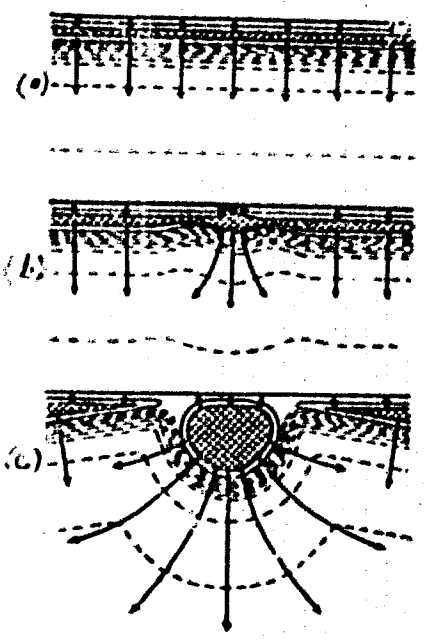

Fig. 7. Spot formation on the anode. Full lines indicate equipotentials at a potential higher than that of the anode; dashed lines indicate equipotentials at a potential lower than that on the anode.

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of the anode glow until they finally disappear. The authors gave also a detailed analysis of processes happening between electrodes and the plasma in three basic situations: (I) when the electrode is more negative than the plasma, (II) when the electrode is more positive than the plasma, and (III) when around the electrode is formed a supplementary plasma (spot). They point out that often the discharge represents a self-oscillating system, and periodic transitions of electrodes, or parts of electrodes, from one basic situation to another leads to a generation of low frequency potential oscillations. The final discussions were based on data from the literature as well as on data obtained by the authors. There are 7 figures; 1 table: and 18 references, 11 Soviet, 3 German, 4 U.S. The U.S. references are: E. Sternglass, Phys. Rev., 95, 345, 1945; S. Rubens, a. J. Henderson, Phys. Rev., 58, 446, 1940; C. Thomas, a. O. Duffendack, Phys. Rev.,

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35, 72, 1939; J. Langmuir, a. H. Mott-Smith, Gen. El. Rev., 27, 767, 1924.

ASSOCIATION: All-Union Electrotechnical Institute, Moscow (Vsesoyuznyy elektrotekhnicheskiy institut, Moskva)

SUBMITTED: January 19, 1959

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34638
S/056/62/042/002/019/05
B108/B104

26.2311

AUTHORS: Pokrovskaya-Soboleva, A. S., Klyarfel'd, B. N.

TITLE: Applicability of similarity law to ignition of a gas discharge in hydrogen

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 42, no. 2, 1962, 427 - 429

TEXT: The ignition potential of a gas discharge depends in different ways on the pressure p and the gap length d. In fact, a departure from the similarity law has been found for hydrogen in the range where $pd < (pd)_{min}$. Experiments showed that these departures were equal for nickel, copper, and stainless steel electrodes, and that they did not vanish even when the gas pressure in the discharge gap was increased. A similar deviation from the similarity law was also found for deuterium. Reference is made to an earlier paper by the authors (ZhETF, 32, 933, 1957) as well as to a paper by L. G. Guseva (Trudy VEI, 63, 1, 17, 1958). There are 1 figure and 5 references: 2 Soviet and 3 non-Soviet. The references to the English-language publications read as follows: G. W. McClure. J. El. and Control.,

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B108/B104

Applicability of similarity...

7, 439, 1959; R. Quinn. Phys. Rev., 55, 492, 1939; W. Carr. Phil. Trans. Roy. Soc., 201, 403, 1903.

SUBMITTED: September 23, 1961

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KLYARFEL'D, B.N.

Cathode spots on the surface of mercury at large arcing currents. Elektrichestvo no.5:70-74 My '62. (MIRA 15:5)

1. Vsesoyuznyy elektrotekhnicheskiy institut imeni Lenina.
(Mercury-arc rectifiers)

KLYARFEL'D, B.N.; FOMINYKH, M.I.

Distribution of a discharge current along the grid of a mercury rectifier. Elektrichestvo no.3:38-85 Mr '63. (MIRA 16:4)

1. Vsesoyuznyy elektrotekhnicheskiy institut imeni Lenina.
(Mercury—Arc rectifiers)

GRACHEV, A.M.; KLYARFEL'D, B.N.; STEPANOV, N.P.

Discharge current distribution along the cross section of a large gas-discharge device. Elektrichestvo no.5:28-33 My '64. (MIRA 17:6)

1. Vsesoyuznyy ordena Lenina elektrotekhnicheskiy institut imeni V.I. Lenina.

AP5005233 EWT(1)/EPA(s)-2/ENT(m)/EPF(c)/EPF(n)-2/EPR/EPA(w)-2/EEC(t)/EWP(t)/
EWP(b)/EWA(m)-2 Pab-10/Pr-4/Ps-4/Pu-4 IJP(c) JD

ACCESSION NR: AP5005233 S/0057/65/035/002/0306/0311

AUTHOR: Klyarfel'd, V.N.; Guseva, L.G.

TITLE: On the nature of the positive current-voltage characteristic of a low pressure electric discharge

SOURCE: Zhurnal tekhnicheskoy fiziki, v.35, no.2, 1965, 306-311

TOPIC TAGS: gas discharge, glow discharge, plasma, low pressure discharge, helium, argon

ABSTRACT: High voltage discharges in helium and argon between plane carbonized iron electrodes were investigated experimentally and the results for helium at 0.08 mm Hg with 8 cm electrode separation are presented graphically. At low currents the potential remained constant at 4.6 kV, but when the current reached a certain threshold the potential increased and plasma could be observed in the vicinity of the anode. With further increase of current the plasma layer became thicker and the potential continued to rise. This increase in potential is ascribed to the effective decrease in the length of the discharge gap as more of the interelectrode space becomes occupied by essentially equipotential plasma. The thickness of the

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ACCESSION NR: AP5005233

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plasma at the anode and the potential drop were measured as functions of the pressure for fixed current and electrode spacing. From the resulting curves the ratio of the ion current to the electron current was estimated and found to be small. From this it is concluded that the high voltage discharge with plasma at the anode and the anomalous glow discharge are "qualitatively identical", differing only in the ratio of the ion to the electron current. As this ratio increases the potential drop approaches a limiting value. This is ascribed either to recombination in the negative glow plasma or to a shift of the position of maximum potential in the anode plasma toward the region of the cathode drop. "V.V.Vlasov, A.Ye.Kulikov and I. Z.Shapiro participated in the experimental portion of the work." Orig.art.has: 4 figures.

ASSOCIATION: Vsesoyuznyy Elektrotekhnicheskiy institut im.V.I.Lenina (All-Union Electrotechnical Institute)

SUBMITTED: 30Apr64 ENCL: 00 SUB CODE: ME,EM

NR REF SOV: 003 OTHER: 004

Card 2/2

L 28485-66 EWT(l)/EWI(m)/EWP(t)/ETI IJP(c) JD

ACC NR: AP6013126 SOURCE CODE: UR/0057/66/036/004/0704/0713

AUTHOR: Kiyarfel'd, E.N.; Guseva, L.G.; Pokrovskaya-Soboleva, A.S. 60 57 B

ORG: All-Union Electrotechnical Institute im. V.I.Lenin, Moscow (Vsesoyuznyy elektrotekhnicheskiy institut)

TITLE: Glow discharge at low pressures and current densities up to 0.1 A/cm^2 24

SOURCE: Zhurnal tekhnicheskoy fiziki, v. 36, no. 4, 1966, 704-713

TOPIC TAGS: glow discharge, hydrogen, nitrogen, neon, argon, gas discharge, plasma, 27

ABSTRACT: Current-voltage characteristics of glow discharges between plane parallel electrodes in H_2, N_2, Ne, and Ar have been measured at voltages from 0.2 to 30 kV, currents from 10^{-9} to 10 A, and values of the pd product (pressure times electrode distance) corresponding to the left-hand branch, the minimum, and a portion of the right-hand branch of the Paschen curve. The diameter of the electrodes was always greater than the distance between them, and care was taken to assure purity of the gases and to avoid distortion of the curves due to thermal effects. The high current discharges were pulsed, the data being recorded on the fall of the pulse. Measurements at intermediate currents by both the pulse and continuous techniques gave concordant results. Many of the recorded current-voltage characteristics are present graphically, and they are discussed at some length. Glow discharges are classified into three groups, for which there are proposed the following designations: Simple

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(or Simplest) Glow Discharge; Dense Glow Discharge; and Normal Glow Discharge. The simple glow discharges comprise the Townsend discharge; which is thus regarded as a kind of glow discharge, and the high voltage discharge; they are characterized by absence of space charge between the electrodes and a potential that is independent of the current over a very wide range. The dense glow discharges are characterized by increase of the voltage with increasing current, decrease of the voltage (at constant current) with increasing value of the pd product, and the presence beyond the cathode fall region of plasma, the potential of which is close to that of the anode and which exhibits a typical negative glow. In the normal glow discharge the potential is almost independent of the value of the pd product, the current density at the cathode is nearly independent of the current (and not proportional to it as in the simple and dense glow discharges), and a negative glow plasma fills only part of the inter-electrode region. As the current is increased at low pressures a simple glow discharge passes directly into a dense glow discharge; at higher pressures there is an intermediate range in which the glow discharge is normal. It is suggested that it may prove necessary to introduce further new terms to describe the still insufficiently investigated glow discharges for values of the pd product exceeding 100 mm Hg x cm. V.V. Vlasov, A.Ye.Kulikov, and A.T.Pavlova participated in the experimental work. Orig. art. has: 7 figures.

SUB CODE: 20 SUBM DATE: 16Jul65 ORIG. REF: 006 OTH REF: 008

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